

BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[385. (06.142)]

ELEVENTH SESSION

MADRID : 5-15 MAY 1930

GENERAL PROCEEDINGS

3rd Section : WORKING

INAUGURAL MEETING

6 May 1930, at 9 a. m.

PROVISIONAL CHAIRMAN : Mr. VALENCIANO Y MAZERÈS,
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

The Chairman. — Gentlemen, our first task is to make up the Secretariat of the Section. On behalf of the Permanent Commission, I suggest that Mr. LE BESNERAIS, Assistant Chief Engineer, Traffic Department of the French Nord Railway, be elected President. (*Applause.*)

I further propose, on behalf of the Permanent Commission, to elect as Principal Secretary Mr. J. P. VAN RIJN, Principal Engineer of the Belgian National Railway Company. (*Applause.*)

— Messrs. Le Besnerais and Van Rijn then took their places.

The President (in French). — Gentlemen, before starting the agenda, I would like with your permission to thank you for the honour you have done me, and at the same time to say that I have much fear that I shall not show myself sufficiently well qualified to conduct as they should be the interesting discussions that we now hope to follow. However I am certain that in appealing to your good nature you will assist me in

these functions by which I am much honoured, although rather nervous thereof.

We have now to nominate the Vice-Presidents, and I propose for your approbation the following :

Mr. A. L. GIBSON, Continental Traffic Manager (South), London and North Eastern Railway;

Mr. P. P. DE ALARCON, Chief Engineer of the Operating Department of the North of Spain Railway;

Mr. H. JEZERSKI, Engineer, Ministerial

Councillor at the Polish Ministry of Communications.

— The Section marked its approval of the nominations with applause.

The Section, on the proposal of the President, then completed the secretarial posts and drew up a provisional agenda.

The President (in French). — We have first of all to collaborate with the First Section (Way and Works) in order to consider Question IX : « Relations between railways and sea ports. »

QUESTION IX.

RELATIONS BETWEEN RAILWAYS AND SEA PORTS.

Lay-out of maritime stations; arrangement of outer and inner basins so that the most efficient lay-out of sidings may be provided for working them; operating and rate fixing methods; loading and discharging appliances.

Preliminary documents.

1st report (all countries, except those hereafter), by Messrs. E. EHRENFREUND and L. BELMONTE. (See *Bulletin*, July 1929, p. 1093 or separate issue No. 11.)

2nd report (America, the British Empire, China and Japan), by Mr. C. M. JENKIN JONES. (See *Bulletin*, October

1929, p. 2257 or separate issue No. 31.)

3rd report (Belgium, France and their Colonies), by Mr. U. LAMALLE. (See *Bulletin*, February 1930, p. 535 or separate issue No. 61.)

Special Reporter : Mr. C. M. JENKIN JONES. (See *Bulletin*, May 1930, p. 1425.)

DISCUSSION BY THE SECTION.

Meeting of the 6 May 1930 (morning).

(1st and 3rd Sections meeting jointly).

PRESIDENT : MR. LE BESNERAIS, PRESIDENT OF THE 3rd SECTION.

— The Meeting opened at 9.30 a. m.

The President (in French). — I suggest, Gentlemen, that as the *Special Reporter*, Mr. Jenkin Jones, is unfortunately ill, we should ask Mr. Gibson, *Vice-President of the third Section*, who has been good enough to act in his stead, to put before you the summaries of the special report. Before asking Mr. Gibson to speak, I think I am voicing the feelings of the Meeting in sending to Mr. Jenkin Jones our most sincere wishes for his

speedy recovery. I will now ask Mr. Gibson to speak.

Mr. Gibson. — I do not pretend to have studied this question nearly so carefully as my friend Mr. Jenkin Jones, who, as you have heard, is ill, but think that perhaps the best thing I can do is to read his résumé of the three reports made on this question — Relations between the railways and sea ports — and then the summary at the end.

— Mr. Gibson then read as stated, vide

— the special report and the summary, pages 1434 et seq. of the *Bulletin* for May 1930.

The President (in French). — I will now ask Mr. Lamalle, Director of the Operating Department of the Belgian National Railway Company, to let us know if he has any additional remarks to add to his interesting report.

Mr. Lamalle, *Reporter* (in French). — I think that the first two paragraphs of the general summaries can be adopted, if not in the wording given, at least in their general sense. It is a question of dealing with a single concentration yard at a port. Exceptions can be admitted in this sense, that there may be several yards in a port, on condition that these yards deal with special traffic.

These are the conclusions that all the reporters have come to. If, however, a station of this type is being considered, it would seem essential that before the making of a supplementary yard can be justified, there should be traffic in complete trains from inland towards the station, and from the station towards the interior. It would perhaps be well to underline this last point.

The President (in French). — Mr. Belmonte, another Reporter, may have some observations to put before us ?

Mr. Belmonte, *Reporter* (in French). — I would like to point out that the report which I drew up in collaboration with Mr. Ehrenfreund, deals with a certain number of ports all of which naturally have their history and their traditions which are often widely different. This is the reason why our report could not enter into details, and that we were not able to formulate any very definite summaries. We limited ourselves to general statements. None the less, I

agree with the findings of the Special Reporter, whilst at the same time reserving the right to discuss each of the points of the general summary.

The President (in French). — Has anybody else any observation of a general character to put before us ? Mr. Belmonte has alluded to the evolution of the ports : he says that each port has its own history which has not depended only on economical conditions, but also on historical conditions, as well as on special and sometimes traditional ones. A port may have developed as the result of economical conditions which no longer exist. We ought especially to consider the conditions which ought to be met at the present time by the relations between the railways and the ports; we ought to investigate those conditions in which a port may be improved or those which have to be kept in view when making a new port. I should like to know if any one has any observations to make on the general conditions or if he would like any additional information to elucidate any point. We will now pass on to the discussion of the summaries presented by the Special Reporter.

Mr. Lamalle (in French). — I am in entire agreement with the remarks just made. At the same time, contrarily to the opinion of my colleague, Mr. Belmonte, I do not think we should be satisfied with merely registering the evolution which is after all a fact, which has taken place in the lay-out of ports. The duty of the Congress is quite different, and is that of bringing to notice the rules to be followed when building an entirely new port, or the way in which an existing port should be extended. We cannot, as some of the replies from the Railways show is the case, con-

tinue to accept the position that a port should be built according to the plans prepared by the Bridges and Roads Department alone.

In preparing the lay-out of a modern port, the collaboration is needed of two services : the Bridges and Roads Department, and the Railways which will serve the port.

Mr. Belmonte (in French). — There would appear to be some misunderstanding seeing that my opinion does not differ from that of Mr. Lamalle. In alluding to the traditional conditions of different ports, I only intended to explain the reasons which led me not to formulate any summary. I am quite in agreement with Mr. Lamalle, and if in my report I have not fully dealt with this question, I am nevertheless in agreement with the statement that when constructing or improving a port it is necessary, if tangible results are to be obtained, to have collaboration between the Public Works Department and the Railways and this right from the start.

I alluded to the historical and traditional conditions to explain the absence of summaries from our report.

The President (in French). — The remarks of the two reporters may be summed up in the following way. We have to consider especially the principles on which a new port should be arranged so as to satisfy in the best possible way the requirements of the State, the shipping, and the railways. Unfortunately in practice it is not so much with ports to be built but with existing ports requiring improvement that we have to deal. Naturally in such a case, the railway has to take already existing conditions into account. Mr. Belmonte adds that present conditions are such that the

conclusions to which we shall come and which we shall consider the best cannot be applied because of the historical and traditional conditions of certain ports. From this emerges an unavoidable observation which cannot be overlooked : if in theory the traditional conditions can be neglected, in practice they cannot be.

I would like to know if any members of the 1st Section interested in the construction of ports, rather than in the working, have any remarks to make. If any delegates wish any point cleared up or have anything to add to the discussion we should be happy to hear them.

— As nobody wished to speak, the President then closed the general discussion.

The President (in French). — We will now consider each of the different summaries which I will ask Mr. Gibson to read one by one.

Mr. Gibson read No. 1.

One harbour concentration yard is preferable where the traffic is of a general nature and comes to the port from all directions and the volume of traffic is within the capacity of a single station.

Several concentration yards are permissible when certain traffics are worked by train services entirely distinct from the general service.

The President (in French). — Mr. Lamalle suggests the addition of the following phrase to this summary : « In any event the construction of several maritime stations is only justified if the volume of traffic is sufficient for complete trains to be sent from the interior to each of these stations and vice versa. »

Has any one anything to say on this summary ?

Mr. Simon-Thomas, Netherlands Railways (in French). — The second para-

graph might be worded as follows : « Several harbour concentration yards may be justified under certain geographical conditions and when certain specific traffics are ensured... »

The President (in French). — I think it would be a mistake to add « under certain geographical conditions ».

To sum up, it is proposed to alter the 2nd paragraph of summary No. 1 as follows : « Several harbour concentration yards may be justified when geographical conditions demand it or when certain specific traffics are ensured... »

The suggestion of Mr. Simon-Thomas falls under the general remarks made by Mr. Belmonte.

Geographical conditions are in fact to be included amongst those which may in some instances make it necessary to depart from the general rules. I would ask the Delegates to say if they have any objections to raise to Mr. Simon-Thomas' addition.

Mr. Gaeremynck, Belgian National Railway Company (in French). — I think that if the addition proposed by Mr. Lamalle and completed by Mr. Simon-Thomas be accepted, it would be as well to end the first section of the summary at the word « preferable ». When « where the traffic is of a general nature and comes to the port from all directions and the volume of traffic is within the capacity of a single yard » is added, the scope of the principle is restricted and in a way that cannot be justified. I believe that the principle is that a single concentration yard is preferable and that very serious reasons are required before departing from it.

I therefore propose to say simply « One harbour concentration yard is preferable ».

The President (in French). — You would therefore suppress the whole of the rest of the paragraph ?

Mr. Gaeremynck. — Yes.

Mr. Belmonte (in French). — The three reports like the special report formulate certain conditions and develop general summaries; they also assert that some special summaries ought to be put forward in the light of certain considerations of a general nature. Amongst these considerations the geographical is found amongst the first. For this reason every alteration alluding to these conditions ought to be put aside.

The four reports in general state, as summaries, that certain conditions should always be kept in mind.

A Delegate (in French). — If I rightly understand, besides Mr. Lamalle's proposal, a further form completed by Mr. Simon-Thomas has been put forward, this form referring to the geographical conditions to be taken into account. If the first paragraph is limited to the few words given, and to it are added those put forward by Mr. Lamalle and Mr. Simon-Thomas, the result is to express more or less the ideas of Mr. Belmonte.

The President (in French). — The different proposals might be summed up as follows. First of all there appears to be agreement in declaring that a single concentration yard is in principle preferable. Nevertheless in taking into account the divers conditions to which allusion has been made, there are three cases in which the existence of several yards might be justifiable. Firstly in the case of special geographical conditions if the traffic exceeds the capacity of a single yard or if a part of the traffic is very heavy.

both as regards the port as well as the railway, so that trains can be worked in one or the other direction from the port to the railway and vice versa.

It therefore seems to me that, subject to a more precise wording, summary No. 1 may be worded as follows :

« 1. In principle, one harbour concentration yard is preferable. Nevertheless, several may be justified, as follows :

« a) Under certain geographical conditions;

« b) If the volume of traffic exceeds the capacity of a single concentration yard;

« c) When certain specific traffics are ensured by special trains entirely independent of the general services. »

Mr. Lamalle proposes to add : « and if the volume of the traffic is such as to make it possible to form complete trains from the interior towards each of these yards and outwards »...

This last addition has raised criticism.

Mr. Lamalle (in French). — « Une gare de concentration unique » sounds better than « Une seule gare de concentration ».

The President. — I agree.

Mr. Lamalle (in French). — In order not to prolong the discussion, I think we could drop the second paragraph of the addition suggested and limit ourselves to giving paragraphs a) b) c) to « ... general services ».

Mr. Leibbrand, Deutsche Reichsbahn Gesellschaft (in German). — Where there is traffic of this kind the number of maritime stations is of little moment. There may be many feeder lines, and a single concentration yard. This condi-

tion of affairs is moreover taken into account in paragraph b) of the summary. If the traffic should become so great that the working capacity of a single yard is not great enough, then additional yards must be built.

The President (in French). — This then is the phrase Mr. Lamalle suggests be not added : « And if the volume of the traffic is such that complete trains can be worked from the interior towards each of these yards and vice versa. »

Mr. Simon-Thomas (in German). — The paragraphs b) and c) seem to be superfluous. When the amount of traffic makes it necessary to build new stations, the situation is no longer the same. Coal trains arriving at a port have to be remmarshalled in particular maritime yards. There is no need for several central yards as one can be enough. It is only when the traffic is of such volume that a single central maritime station cannot cope with it that other yards become necessary, but as regards the through and direct trains only one station is needed. I therefore agree with Mr. Lamalle in thinking that the two last paragraphs should be deleted.

The President (in French). — Mr. Simon-Thomas is therefore in entire agreement with the observations made. I think if the last part of the phrase be crossed out, everybody will be satisfied.

Mr. Lamalle (in French). — I should like to add a few words to clear up any misunderstanding. I do not agree with any second supplementary yard for general traffic being built if the trains are not complete. I would admit that in the case of special traffic complete trains should be worked to the quay side, special traffic such as coal and ore, whether

for import or export, and I quite understand Mr. Leibbrand when he says that complete trains of special traffic are worked straight through to the quay. I consider it uneconomical, however, to provide a second yard if there are no complete trains from or to the interior for this station. None the less, I renew my proposal to drop the last phrase.

The President (in French). — I think everyone is in agreement with the summary as I read it just now, leaving out the last phrase.

— No objection having been raised, Mr. Gibson read summary No. 2 :

The stations should have separate groups of sidings an running lines for inward and for outward traffics.

The President (in French). — Has any one any remarks to make ?

— As no further remarks were made, summary No. 2 was adopted.

The President (in French). — We will now take summary 3.

Mr. Gibson. — Summary No. 3 :

The yard should be sufficiently large to take up the repercussions due to temporary cessation of traffic movements in either direction.

The President (in French). — Has any one any remarks to make on summary 2?

Mr. Lamalle (in French). — Allow me, Mr. President, to come back to summary No. 2. I must confess I do not quite grasp the sense of it. It says : « The stations should have separate groups of sidings and running lines for inward and for outward traffics. » I think this item wants some clearing up, as, for my part, I do not know what the Special Reporter meant exactly.

Mr. Gibson. — The meaning of this paragraph is that the traffic should be divided in two; the import traffic and the export traffic, *i. e.*, a separate group of sidings for each. In other words, a complete equipment for the export traffic, and a complete equipment for the import traffic.

Mr. Lamalle (in French). — Do you not think it advisable to delete this summary? I do not think it indispensable to have special sidings for import and others for export traffic. The Special Reporter may have wished to speak about the lines at the back of the quay dealt with in summary No. 6 — I do not know. So far as I am concerned, as I do not consider summary No. 2 sufficiently clear, I suggest it be suppressed.

Mr. Leibbrand (in German). — Possibly the text in question should be interpreted in the sense that the maritime station must be sufficiently large to hold at any given moment the accumulation of wagons as a result of the ships and trains not following the same rate of movement as regards both arrivals and departures. The result is some interruption in the flow of traffic, a certain lack of harmony between the movements to destinations and those from the docks. It then becomes necessary to provide a « buffer » between the harbour lines properly speaking and the arrival and departure lines of the port. The yard must be large enough to meet this requirement.

Mr. Lamalle (in French). — Summary 3 reproduces exactly what our colleague has just said. In fact it reads « The yard should be large enough to absorb any momentary stoppage in the movements of traffic in one or other direction ».

This applies to Mr. Leibbrand's interpretation. Paragraph 2 can therefore be dropped out.

The President (in French). — It is proposed to delete summary 2, the reasons for it leading up equally to summaries 3 and 6 which we are going to examine.

In these circumstances have you, Mr. Gibson, any objection to raise to this summary being suppressed ?

Mr. Gibson. — I do not agree with Mr. Lamalle. Export traffic should be kept separate from import traffic — they have nothing to do with each other. Concentration yards should be sufficiently big to take up congestion caused by delays. The summary ought to stand, and to be considered as entirely distinct from summary 6.

Mr. Belmonte (in French). — I think summary 2 ought to be interpreted in this sense that in a maritime station facilities provided for traffic in a given direction, for example arrival traffic, ought to be distinct from those provided for the departure traffic. This is, I think, Mr. Gibson's idea.

The equipment of a maritime station cannot be alike for incoming and outgoing traffic. There should be a distinction.

The President (in French). — Your opinion, Mr. Belmonte, is that the summary should be left as it is ?

Mr. Belmonte. — Yes.

The President (in French). — I would like to propose a summary which would, I think, satisfy everybody. Maritime stations should be equipped in such a way as to be able to deal with, simultaneously, both import and export traffic.

This it seems to me is how the second summary should be drawn up.

Mr. Lamalle (in French). — This is almost self evident.

The President (in French). — When we succeed in coming to sensible summaries, we cannot help ending in self evident truths. I think that so drafted, the second summary would be satisfactory.

Mr. Lamalle (in French). — I raise no objection to it.

The President (in French). — We will now put the question to the vote. Should this summary be retained or suppressed, or should another text conforming to that I proposed be adopted ?

— The Section decided to retain summary 2 as worded by the Special Reporter.

The President (in French). — This vote having been taken, we now take summary No. 3 which was read just now. Has any one anything to say about it ?

— As no one wished to speak, summary No. 3 was adopted.

We now come to the fourth summary which I will ask Mr. Gibson to be good enough to read to you.

Mr. Gibson. — Summary 4 :

The concentration yard may be used for shipping, local, and through railway traffics so long as the limit of capacity of a single yard is not exceeded.

Mr. Simon-Thomas (in French). — I suggest the end of this summary be altered. Instead of ending with « so long as the limit of capacity of a single yard is not exceeded » I would prefer « and the organisation of the maritime service does not suffer ».

Mr. Gibson. — I think this is what the Special Reporter means. I therefore agree to this proposition.

The President (in French). — Does the meeting agree with the modification suggested by Mr. Simon-Thomas ?

Mr. Lamalle (in French). — I had intended to submit the same alteration.

The President (in French). — Summary No. 4 should therefore be worded as follows :

« The concentration yard may be used for shipping, local and through traffics, so long as the organisation of the maritime service does not suffer. »

It amounts to much the same thing as if the capacity of a yard is not exceeded none of the three classes of traffic should suffer. It is really a question of wording.

Mr. Lamalle (in French). — The English wording seems to me to be more definite, and to convey the idea better than the French.

The President (in French). — We have before us two proposals :

1. to retain the Special Reporter's wording;

2. to use the wording suggested by Mr. Simon-Thomas and to which Mr. Gibson raised no objection. This consists in replacing the end by the phrase « so long as the organisation of the maritime service does not suffer ».

Mr. Gibson. — The two proposals might be combined.

The President (in French). — That is true, we could say « so long as the limit of capacity of a single yard not being reached, the organisation of the maritime service does not suffer ». I think

that so worded, the summary No. 4 will meet everybody's wishes. Has anyone any observation to make on this wording?

As no one desired to move any further alteration, summary. No. 4 was adopted with the following wording :

« 4. The concentration yard may be used for shipping, local and through railway traffics, so long as the limit of capacity of a single yard is not exceeded and the organisation of the maritime service does not suffer. »

Mr. Gibson then read summary No. 5 as follows :

The shunting may with advantage be concentrated in the harbour station and the shunting at the quays limited to sorting to hatches and destination order when loading direct to ships, or to shed or warehouse bench order.

The President (in French). — As no one has made any observations, we will take the text as adopted.

Mr. Gibson. — Summary 6 is worded as follows :

Ample holding tracks should be provided at the quays to ensure continuity of service at the ships or sheds.

The President (in French). — As no objection has been raised to this summary, it is adopted.

Mr. Gibson. — Summary 7. This summary reads :

Wagons discharged at the quays should not be passed back empty to the concentration yard provided they can be re-loaded at quays to which they have ready access.

The President (in French). — I think there are no remarks to make on this. Summary 7 is adopted, and we will pass on to summary 8.

Mr. Gibson. — Summary 8 :

Consignments for export should not be split up en route unless the traffic is passing in such volume that continuity of loading can be maintained.

The President (in French). — Summary 8 is adopted without alteration.

Mr. Gibson. — Summary 9 reads :

The lay-out of harbours should permit of the adoption of easy railway curves, 6 chains being considered to be the minimum permissible.

The President (in French). — On this subject the members of Section 1 may have something to say. It relates to the laying in of curves in such a way as to allow the wagons to run freely through them.

Allusion is also made to the oblique lay-out of the inner basins and piers. I think we ought to be able to obtain some additional and valuable information on this subject.

Mr. Müller, Deutsche Reichsbahn Gesellschaft (in German). — I think that the radius of 120 m. (6 chains) is too small when large locomotives have to work over the lines. I suggest the minimum radius be fixed at 160 m. (8 chains) or better still at 180 m. (9 chains).

The President (in French). — The Ways and Works Department ought to say whether this condition is too severe and if it would allow the quay lines to be worked under good conditions.

Mr. Lemaire, Belgian National Railway Co. (in French). — In most cases there are great difficulties to be overcome before railway lines with suitable radii can be laid down in ports.

As Mr. Lamalle has shown in the summaries of his report, the difficulties are due to the inner basins being built at an angle.

The radius of 120 m. (6 chains) is, I think, insufficient. First of all because if we use this radius in our projects we shall have difficulty in keeping to it when laying the lines. Then too, 6 and 8-wheel coupled shunting locomotives will only travel round 120-m. curves with difficulty; they will deform the lines the radius of which we shall then have to alter. In Belgium we apply a minimum of 150 m. (7 1/2 chains) on all lines run over by locomotives. I suggest summary 9 be worded as follows :

« The general lay-out of ports should be such that the railway lines may be laid with curves of a maximum radius of... »

The President (in French). — And what figure do you suggest ?

Mr. Lemaire (in French). — 150 m. (7 1/2 chains). Our German colleagues say they require 160 or 180 m. (8 or 9 chains). There are possibly reasons in Germany why such radii are necessary. In Belgium however, the radius of 7 1/2 chains is the standard for 6 and 8-wheel coupled locomotives. We are limited by local conditions, and sometimes it is very valuable to be able to gain a half or a whole chain.

Mr. Lamalle (in French). — I agree with our German colleagues and with Mr. Lemaire, and I accept 6 chains as a minimum radius below which it is difficult, if not impossible, to go. But we have to deal with maritime requirements.

Furthermore, in locomotive dépôts, I think there are many tracks of less than 9 chains curvature. Seeing we use 6, 8, and even 10-wheel coupled engines at the

docks, we must believe the Locomotive Running Department able to solve the problem of working these engines over curves of less than 9 chains radius.

I would like to put before you some remarks of a general nature in the direction the President developed just now, that is as regards the setting out of the inner basins. The radius of the curves is determined by the obliquity of the inner basins with regard to the main basin. In the report I drew up I put forward a summary possibly rather lengthy, as I thought it required to be dealt with clearly. Under paragraph 8 of my summaries, I said :

« Although the configuration of a port (form and extent of its basins, etc.) is designed to afford facilities for the entrance, mooring and departure of ships, it is nevertheless desirable that the railway should be asked to express its views when plans are under consideration. Subject to ensuring the above-mentioned facilities, that configuration should be adopted which will allow of the most suitable railway installations (*i. e.* lines serving the quays and connecting lines between the quays and the harbour station) both from the technical and from the commercial point of view. »

We must not forget that the commercial point of view must have preference : we have to meet the wishes of the commercial interests.

With regard to point 9, my summary was as follows :

« The lay-out of the harbour basins should be planned in such a manner as, without interfering with the operations connected with the entrance, mooring and departure of ships, will allow of the provision of curves of sufficient radius (a minimum of 120 m. [6 chains]) for the connecting lines between the quays and the harbour station. »

If we show ourselves too difficult, our colleagues of the Public Works Department responsible for building the docks will not always be able to meet our wishes.

Mr. Fraser, London & North Eastern Railway. — I do not consider it advisable that the minimum should be raised, as under certain conditions the minimum permissible is necessary. The wording of the paragraph is, in my opinion, quite broad enough to meet the views of those who prefer the minimum raised so as to meet their special requirements.

This minimum has been suggested so as to cover conditions operating in each case and should therefore be retained.

Mr. Fiori, Italian State Rys (in French). — Mr. Lamalle's remark is well founded. We must not make the conditions too difficult, as this may adversely affect the construction of harbours. So far as we are concerned we have small shunting locomotives which can work over 6-chain curves. The summary of the Special Reporter is well chosen, the curve of 6 chains only being allowed as the absolute minimum. I support therefore Mr. Lamalle's proposal and am for retaining the Special Reporter's wording.

Mr. Fowle, Great Indian Peninsula Railway. — I think the minimum radius of 120 m. (6 chains) applies to continental and English tracks. In India, where the gauge is much wider, we want 180 m. (9 chains); with the proposed minimum the crossing angle becomes very sharp. I therefore suppose that this minimum is only fixed as a general rule for 1 435-m. (4 ft.-8 1/2 in.) standard track.

Mr. Müller (in German). — We are not dealing here with a question special to ports, but with a general question affecting standard gauge lines. We

should ask ourselves if there is any need in this case to lay down any limit. I consider a limit need not be given for all circumstances and that consequently we should say « When using special shunting engines curves may be as small as 120 m. (6 chains) radius ».

Mr. Fox, Central Argentine Railway. — In the Argentine, the ruling minimum for 5 ft-6 1/2 in. gauge is 9 chains, and that is one of the questions I want to call attention to. I do not think it is quite fair to fix 6 chains without mentioning it is for the 4 ft-8 1/2 in. gauge. It ought to be maintained that 9 chains should be the minimum for the 5 ft-6 1/2 in. gauge.

The President (in French). — The discussion could be summed up as follows : Everybody agrees that we should say that the general lay-out of harbours should be such as to allow the railway lines to be laid in with very large curves. The first phrase could therefore be worded as follows : « 9. The lay-out of harbours, and particularly the orientation of jetties and moles, should permit of the adoption of easy railway curves. » I think we are all in agreement on this text.

No objection was raised on this first part of summary No. 9.

The President (in French). — The point where there is a difference of opinion is whether in the summaries we should indicate a minimum figure, and what it should be.

First of all the figures that have been quoted only apply to standard gauge lines. These figures ought not to be applied to wide gauges discussed a little while ago, nor to narrow gauge lines which in certain important ports run right down to the quays. We could

therefore give a figure for standard gauge lines.

Everybody agrees with the first part of the summary. But in the following part of the text should any figure be given ?

If so let us discuss it and decide what it should be.

Mr. Gibson. — If there is any question of quoting a figure for a standard gauge line, I am in agreement.

The President (in French). — After the first phrase which has been adopted, ought we to give the figures ?

Mr. Lamalle (in French). — I consider that it is essential to give a definite figure, if only for the benefit of our Colleagues in the Locomotive Running Department, so that they should have definite knowledge on the problem to be solved.

Mr. Direz, French State Rys. (in French). — I do not think it necessary to fix a minimum radius of curves in the ports any more than it is in the shunting yards or any sidings in the yards. The fixing of a minimum radius might cause great difficulties to the railway. Upon this point I would call your attention to the fact that in France in certain ports there are curves which are not even 6 chains radius.

The President (in French). — I think that if it is desired to give a figure, we shall be obliged to indicate that the minimum figure given corresponds to standard lines and for ordinary operating conditions. With locomotives of special type, and on certain lines, in old ports, the work is done under satisfactory conditions. Now it is not possible to consider altering the radius in places where the said radius gives satisfaction.

The summary that we formulate is one of principle which can be applied when building a new port or when improving an old one.

To lay down a figure is perhaps not altogether essential.

In fact we say that the radii ought to be large. We ask therefore a radius that will let wagons run freely. Now in fixing a figure, the summaries come to will be perhaps insufficient, as they ought to be considered from the special point of view of wagons and locomotives, not only in the ports, but also in the yards.

A Delegate (in French). — It would be useful to give a figure as this would strengthen the proposals put forward by railway engineers when drawing up the plans, which have to be submitted to other Authorities and in especial the Administration of Bridges and Roads.

The President (in French). — We have therefore before us two opinions which, I think, could be brought together as follows. A first opinion consists in saying that it is not a question solely relating to the ports, where moreover the figure that might be given would depend upon the gauge and the type of engine, standard or special, and that consequently it is not opportune to mention any figure in the summary; the other opinion says that it is desirable to quote a figure in the summary as this figure will support railway engineers when discussing lay-outs with the maritime service.

Mr. Lemaire (in French). — I am also of the opinion that the Permanent Way Engineers not only have to discuss the question with the Bridges and Roads Services and with the City Authorities but that they have to reconcile differing interests.

In giving a figure in our summaries

it would be possible then, when having such discussions to say :

« These are the summaries accepted by the International Railway Congress Association, in Madrid » and our arguments would be much more weighty: we would be stronger, and better heard if we could say that the Congress which includes the great majority of the Governments of the World, had stated a definite opinion. In giving a figure, we would make discussions with other authorities much easier.

As a permanent way engineer I would add that the problem of laying out the line is a special question: it is a geometrical problem, which has to take into consideration the orientation of the inner basins and of the railways.

Looking at it from the geometrical point of view, I also consider that it is desirable to state a minimum radius for the standard gauge.

Mr. Palmieri, Italian State Rys. (in French). — I agree with Mr. Lamalle's opinion. I consider that it is better to fix a minimum radius of curves because the question relates not only to the work of our Colleagues of the Permanent Way who have to draw up the plan of the yard, but also to the Engineers who design the inner basins and jetties of the ports.

Fixing this minimum radius is very important, because in building a port it is first of all necessary to decide upon the orientation of the basins, and their obliquity relatively to the other installations, and subsequently the minimum radius allowable for the curves of the lines which have to cover the working of the jetties.

The President (in French). — Every-

one, I think, has now given his opinion. Is it necessary to indicate the figures?

A Delegate (in French). — It seems to me desirable that the curves should be such that all the locomotives can run right through to the quay. Ultra modern engines are not always available for operating and it seems to me that it would be useful to draw some distinction between the running lines properly speaking, which all locomotives ought to be able to use, and the secondary lines on which it should be possible to agree to the use of 9-chain curves.

The President (in French). — If it is decided to mention a figure, we will see if we ought to give the same for all the lines.

A Delegate (in French). — I am only thinking of standard gauge lines.

The President (in French). — Certain members consider that it is not desirable to mention any figure. I am therefore putting this question to the vote.

— The majority of the Meeting declared in favour of indicating the minimum radius of the curves.

We will therefore give a figure. I suggest the following wording:

« For standard gauge lines, a radius of 120 m. (6 chains) is considered as the minimum allowable. It is desirable however, to increase this minimum to 150 m. (7 1/2 chains) at least in the case of lines over which large shunting engines of the usual type work. » Has any one anything to say on this wording?

Mr. Müller (in German). — It says that the minimum radius is 120 m. (6 chains) but that it is advisable to increase this to 150 m. (7 1/2 chains); why not to 180 m. (9 chains)? I suggest

we say: « It is desirable to make it 180 m. (9 chains). »

Mr. Fox, Central Argentine Rys. — In the Argentine there are three gauges, which differ considerably. We have the 3 ft.-3 3/8 in., the 4-foot and the 5-foot gauges. As regards the wide gauge, that is the 5 ft.-6 1/2 in., would it not be necessary to make the curves larger?

.7 1/2 chains is not enough; it would appear essential to adopt 8 chains for the wide gauge.

The President (in French). — We could state that for the standard gauge of 4 ft.-8 1/2 in., a minimum radius of 6 chains is required, and add that for larger gauges the figures should be adjusted to suit.

Subject to this remark should the summary given just now be adopted?

Mr. Lemaire (in French). — The French text reads: « minimum admissible », which was translated from the English « permissible minimum ». I think it would be better to say « minimum » by itself.

The President (in French). — The following then is the final wording:

« For standard gauge, a curve of 120 m. (6 chains) radius is considered to be the minimum. It is desirable to increase this to 150 m. (7 1/2 chains) for tracks used by the larger locomotives of normal type. »

« The figures relative to wide and narrow gauges should be arranged according to the respective needs. »

This point being agreed, we now take summary No. 10.

Mr. Gibson. — Summary No. 10:

Adequate room should be provided at quays for the movement of ships, and

also on the jetties for the necessary quayside and middle tracks, and for the sheds and shed lines. The sheds and tracks should be laid out so that interruption to loading operations during shunting movements is reduced to a minimum.

The President (in French). — Are there any observations on this summary? I think not.

Mr. Lamalle (in French). — I would like to put forward an observation on this paragraph. I think the wording is not very clear.

In a port we find in fact, one thing, that is that very large spaces are reserved to the ships, and that on the quays only an extremely narrow area is left to the railways.

It is necessary to change the practice and to require that greater width is given to the quay, so that the railway can, not only lay in the running lines required, but also quay lines and storage lines at the back of the quay, so as to ensure the wagons having a faster turn round than that obtained at the present time with difficulty.

The President (in French). — Would it not be possible to say : « Une place *largement* suffisante (amply sufficient) doit être prévue aussi bien aux quais que sur les jetées pour les voies à quai, etc. »

I propose therefore to say « *largement* suffisante » instead of « *suffisante* » at the beginning of the text, to show that sufficient place is required.

Mr. Lamalle (in French). — Do you not think that in the first part we ought to leave out the question of ships? The placing of the vessels does not interest us directly. What does occupy our attention is that we should have sufficient space for the quay lines, the run-

ning lines, and the sidings at the back of the quay.

The President (in French). — This is already mentioned under No. 6, where it states : « Ample holding tracks should be provided at the quays to ensure continuity of service at the ships or sheds. »

Mr. Lamalle (in French). — No mention is made of the sidings behind the quay.

The President (in French). — Mr. Lamalle suggests to suppress in No. 10 the part dealing with ships. Do we agree with this deletion, or on the contrary, — does any one wish to retain the wording as given by the Special Reporter?

Mr. Belmonte (in French). — I think that we could meet the wishes of everybody by substituting for summary No. 10 of the Special Reporter that given as No. 10 in Mr. Lamalle's report worded as follows :

« From the point of view just mentioned, it is necessary not only that the quay spaces should be of a width proportionate to the width and length of the basins, but also that they should afford the railway adequate room for a lay-out of tracks which will ensure that rapid movement of wagons which is essential to commercial operations. »

The President (in French). — Mr. Gibson, have you before you the English text of Mr. Lamallé's summary? Do you agree with the proposed substitution?

Mr. Gibson. — To make Mr. Lamalle's text comprehensible it should be slightly modified. This text begins as follows : « From the point of view just mentioned, it is necessary... » Inserted as it stands in the summary of the special report, this text is hardly understandable. Apart

from this alteration, I do not object to the proposition put forward.

The President (in French). — We will ask the Secretaries to edit the proposed wording. Under these conditions, do you agree that this text be adopted?

— The Meeting showed its assent and summary No. 11 was then taken in hand.

Mr. Gibson. — Summary No. 11 :

There should be at least three tracks alongside the quays with crossings at intervals in order to give the best working facilities.

— Approved.

Mr. Gibson. — Summary No. 12 :

Switches should be used generally and are preferable to turntables or traversers for shunting purposes.

— Approved.

Mr. Gibson. — Summary No. 13 :

At quays where road vehicles are largely used, quay tracks with grooved rails sunk to the ground level are convenient, and this arrangement permits tow-motors to be used in place of ordinary locomotives for shunting duties.

— Approved.

Mr. Gibson. — Summary No. 14 :

The capacity of quay cranes should not exceed the weight of the bulk of the articles to be lifted. Dual capacity cranes are economical and provide for occasional lifts that are heavier than normal. Cranes should be arranged to give free movement of wagons along the quays and to have sufficient reach to plumb the wagons on the quay lines and the further side of the ships hatches.

Cranes of the luffing type have many advantages.

High capacity floating cranes are considered to be the most satisfactory means of handling heavy lifts.

For loading and unloading wagons and sorting and storing traffic in sheds and warehouses, travelling bridge cranes fitted with revolving jibs which can be projected through the shed sides over outside wagon tracks are efficient.

The number of quay cranes per berth is considered to be as important a consideration as the determination of their capacity. The number should not be less than the normal number of hatches in vessels regularly using the port.

Mr. Direz (in French). — I would like to make a remark. It is more a question of form than of substance. At the beginning of the summary, it reads, in the French text : « La puissance des grues de quai ne doit pas dépasser le poids, etc... » (« The power of the cranes on the quay should not exceed the weight, etc... »)

The only drawback of a crane the power of which exceeds the weight of most of the loads to be handled, is the unnecessary expenditure. There is no need for a crane to exceed a given power. The text might be altered to read :

« No useful purpose is served by providing a crane appreciably more powerful than... » or « the power of the crane on the quay should not exceed... ».

Mr. Lamalle (in French). — I think that some general statement ought to be inserted at the beginning of the summary.

I share the general idea put forward by Mr. Direz. In fact, on a quay for general purposes, it is not necessary to have powerful cranes. What is needed is to have many cranes.

The idea ought to be retained. We could say :

« On quays for general working, it is necessary to have very many cranes. These cranes need not necessarily be of very great power. » In fact, if the crane is very powerful, the amount to pay is higher.

The President (in French). — We could say :

« The capacity of quay cranes in general use should not exceed the weight of the bulk of the articles to be lifted. »

Mr. Lamalle (in French). — I think however that we ought to say that in a port, powerful cranes are required for certain special traffics.

The President (in French). — This is the reason why I said : « Quay cranes in general use. » If the Special Reporter sees no objection, we could after adding the words « à usage général » (« in general use ») replace « ne doit pas » (« ought not ») by « should ». The first part of the summary would then become...

« The capacity of quay cranes in general use should not exceed the weight of the bulk of the articles to be lifted. »

— The end of the summary would not be changed in any way.

Has anybody any objection to raise ?

— Summary No. 14 was then adopted with this alteration.

Mr. Gibson. — Summary No. 15 :

In order to reduce wagon detention, the demurrage regulations should be as severe as traffic working and labour conditions permit in order to guard against congestion at the port and to conserve the railway wagon stock.

The President (in French). — Has anyone anything to say ?

Mr. Gaeremynck (in French). — There is a distinction to make between « blocking up » and « immobilising the rolling stock ». The ports are sometimes blocked up through some special cause which has nothing to do with the stock. In order to avoid it being due to the rolling stock, it would be better to say : « to constitute a safeguard against the immobilisation of the rolling stock, which is a cause of congestion of the harbour. »

The President (in French). — There is a distinction to make between the blocking up of the port, and the use of the railway rolling stock. It is the congestion of the port that is feared.

Mr. Gaeremynck (in French). — We are much more frightened of the ports being blocked up than that the railway rolling stock should be immobilised. Now immobilising the rolling stock is one cause of the harbour being blocked up.

The President (in French). — Blocking up the port and immobilising the wagons is not always due to the same cause.

Mr. Lamalle (in French). — I could not say I agree with Mr. Gaeremynck. The paragraph ought to be left as it is worded. It is a question of two entirely distinct services. In fact, congestion in the port ought to be avoided at all times.

When traffics are heavy, it is essential to avoid immobilising the rolling stock in order to have available every bit of it required. I think that the two points ought to be dealt with in the summary.

The President (in French). — Congestion of the port might be overcome by

stabling the wagons elsewhere, which however, would not avoid immobilising the wagons. The two conditions have therefore to be covered.

Mr. Gaeremynck, do you wish to retain your remarks ?

Mr. Gaeremynck. — No.

— This summary was then adopted.

Mr. Gibson. — Summary No. 16 :

The organisation of the staff working the port and the railways and the customs is of the greatest importance and should be such that the services can proceed smoothly and rapidly.

Finally, the desirability of close collaboration between the railway companies and the port authority, when alterations, additions, or new harbours are contemplated cannot be too strongly stressed.

The President (in French). — Has anyone anything to say ?

— Summary 16 was then adopted.

The President (in French). — We have now dealt with all the summaries, and the report as a whole has been adopted subject to certain modifications. Mr. Lamalle now wishes to speak.

Mr. Lamalle (in French). — I should like to have seen a summary added before number 15. I suggest we add a summary 14*b* worded as follows :

« In order to hold to a port any specific heavy traffic, it is indispensable that special accommodation be reserved

for it, adequately provided with appropriate handling appliances. »

The President (in French). — This is summary No. 16 of Mr. Lamalle's report.

Mr. Belmonte (in French). — I support Mr. Lamalle's proposal.

The President (in French). — Mr. Gibson, do you agree ?

Mr. Gibson. — Yes.

The President (in French). — The proposal of Mr. Lamalle is adopted, and will be inserted as No. 15 between the 14th and 15th of the Special Report, which will then become No. 16.

We now have to give a title to the whole of our summaries.

In French the text reads : « The maritime station ». I think we should say : « The railway lines of a large port. »

In fact, in the special report, it says that it deals solely with large ports, not only with the yard, but also with all the railway lines of the ports. I suggest therefore, we entitle our summary « The railways of a big port ».

Do you all agree ?

As no objection is raised, this will be done.

Gentlemen, I would now like to thank you for having stayed so long and for having expressed your opinions with the necessary brevity needed for dealing with this interesting question quickly.

— The meeting closed at 1 p. m.

DISCUSSION AT THE GENERAL MEETING.

Meeting on 10 May 1930 (morning).

PRESIDENT : Mr. JOSÉ GAYTAN DE AYALA.

GENERAL SECRETARIES : MESSRS. P. GHILAIN and A. KRAHE.

ASSISTANT GENERAL SECRETARIES : Sir HENRY FOWLER, K. B. E., MESSRS. P. WOLF
and J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary*. — We now come to the examination of question IX. Are there any remarks with regard to the wording of the summaries as given in the *Daily Journal of the Session*.

— No objections being raised we may consider that text as approved.

The President (in French). — The final summaries are consequently as follows :

SUMMARIES.

The railways of a big port.

« 1. In principle, one harbour concentration yard is preferable. Nevertheless, several may be justified, as follows :

« a) Under certain geographical conditions;

« b) If the volume of traffic exceeds the capacity of a single concentration yard;

« c) When certain specific traffics are

« ensured by special trains entirely independent of the general services.

« 2. The stations should have separate groups of sidings and running lines for inwards and outwards traffics.

« 3. The yard should be sufficiently large to take up the repercussions due to temporary cessation of traffic movements in either direction.

« 4. The concentration yard may be used for shipping, local and through railway traffics, so long as the limit of capacity of a single yard is not exceeded and the organisation of the maritime service does not suffer.

« 5. The shunting may, with advantage, be concentrated in the harbour station, and the shunting at the quays limited to sorting of hatches and destination, order when loading direct into ships, or to shed or warehouse bench order.

« 6. Ample holding tracks should be provided at the quays to ensure continuity of service at the ships or sheds.

« 7. Wagons discharged at the quays
« should not be passed empty to the
« concentration yard if they can be re-
« loaded at quays to which they have
« ready access.

« 8. Consignments for export should
« not be split up en route unless the
« traffic is passing in such volume that
« continuity of loading can be main-
« tained.

« 9. The lay-out of harbours, and par-
« ticularly the orientation of jetties and
« moles, should permit of the adoption
« of easy railway curves : for standard
« gauge, a curve of 120-m. (6 chains)
« radius is considered to be the mini-
« mum. It is desirable to increase this
« to 150 m. (7 1/2 chains) for tracks
« used by the larger locomotives of nor-
« mal type.

« The figures relative to wide and nar-
« row gauges should be arranged accord-
« ing to the respective needs.

« 10. It is important not only that
« the quays be constructed of sufficient
« width in relation to the size of the
« dock, but also that sufficient space
« should be reserved on the quays for
« the railway to lay down methodically
« its lines in order to allow such speed
« of movement to trucks as will meet
« the requirements of commerce.

« 11. There should be at least three
« tracks alongside the quays with cross-
« ings at intervals in order to give the
« best working facilities.

« 12. Switches should be used generally
« and are preferable to turntables or tra-
« versers for shunting purposes.

« 13. At quays where road vehicles are
« largely used, quay tracks with grooved
« rails sunk to the ground level are con-
« venient, and this arrangement permits

« tow-motors to be used in place of or-
« dinary locomotives for shunting duties.

« 14. The capacity of quay cranes in
« general use should not exceed the
« weight of the bulk of the articles to
« be lifted. Dual capacity cranes are
« economical and provide for occasional
« lifts that are heavier than normal.

« Cranes should be arranged to give
« free movement of wagons along the
« quays and to have sufficient reach to
« plumb the wagons on the quay lines
« and the further side of the ships
« hatches.

« Cranes of the luffing type have
« many advantages.

« High capacity floating cranes are
« considered to be the most satisfactory
« means of handling heavy lifts.

« For loading and unloading wagons
« and sorting and storing traffic in sheds
« and warehouses, travelling bridge cra-
« nes fitted with revolving jibs which
« can be projected through the shed
« sides over outside wagon tracks are
« efficient.

« The number of quay cranes per berth
« is considered to be as important a con-
« sideration as the determination of their
« capacity. The number should not be
« less than the normal number of hatches
« in vessels regularly using the port.

« 15. In order to hold to a port any
« specific heavy traffic, it is indispen-
« sable that special accommodation be
« reserved for it, adequately provided
« with appropriate handling appliances.

« 16. In order to reduce the time wa-
« gons are detained, the prescriptions re-
« gulating the penalties for delay ought
« to be as stringent as permitted by oper-
« ating and labour conditions, so as to
« constitute a safeguard against blocking

« up the harbour and against immobi-
« lisation of the railway rolling stock.

« 17. The organisation of the staff of
« the harbour, the railway and the cus-
« toms is of the highest importance and
« ought to be such as to enable all ser-
« vices to function smoothly and rapidly.

« Finally, too much stress cannot be
« laid on the necessity for a close colla-
« boration between the Railway Compa-
« nies and the Port Administration when
« it is a question of altering or extend-
« ing existing harbours or planning new
« ports. »

QUESTION X.

METHODS TO BE USED IN MARSHALLING YARDS TO CONTROL THE SPEED OF VEHICLES BEING SHUNTED, AND TO ENSURE THEY TRAVEL ON TO THE LINES IN THE VARIOUS GROUPS OF SIDINGS.

Preliminary documents.

1st report (all countries, except those hereafter), by Mr. C. FIALA. (See *Bulletin*, August 1929, p. 1277 or separate issue No. 14.)

2nd report (America, the British Empire, China and Japan), by Mr. C. R. BYROM. (See *Bulletin*, June 1929, p. 713 or separate issue No. 6.)

3rd report (France, Italy, Portugal,

Spain and their Colonies), by Messrs. PELLARIN and FARENC. (See *Bulletin*, December 1929, p. 3039 or separate issue No. 47.)

4th report (Germany), by Dr. Ing. P. GOTTSCHALK. (See *Bulletin*, January 1930, p. 309 or separate issue No. 57.)

Special Reporter : Mr. C. R. BYROM.
(See *Bulletin*, May 1930, p. 1437.)

DISCUSSION BY THE SECTION.

Meeting held on the 8 May 1930.

PRESIDENT : Mr. LE BESNERAIS.

— The meeting opens at 9.30 a. m.

The President. — I call on Mr. Byrom, *Special reporter*.

Mr. Byrom, *Special Reporter*. — Gentlemen, I presume you have all been able to read the special report which I have drawn up with regard to Question X. I therefore propose to merely read the summary.

— Mr. Byrom then read the summary

of his special report as it appears on pages 1444-1446 of the *Bulletin*, May 1930 issue, and also the supplement regarding Dr. Gottschalk's report (p. 1447).

The President (in French). — I would like to thank Mr. Byrom for having been good enough to read to us his valuable summaries.

Before taking these summaries one by one, I should like to ask the other Reporters if they have any special point to

which they would like to call attention. I would also ask the other Members present if they have any general observations to put before us, before we start examining each summary in particular.

Mr. Fiala, *Reporter* (in French). — I think we should complete our summaries by a point which appears to me to be important. Some railways use hand brakes for regulating the speed of vehicles shunted off. In this case all the vehicles have to be fitted and this means an increase of the tare weight of the wagons, and consequently of the train. This system is therefore hardly profitable, and this is what I wish to bring out by extending the summaries in this sense, in a form to be decided upon, for example at the end of paragraph 2.

The President (in French). — We will come back to your point when dealing with summary 2. For the moment we are discussing the question generally.

Does any body wish to speak ?

Mr. Gottschalk, *Reporter* (in German). — Following up the excellent summaries of Mr. Byrom, I would like to call attention to certain points which appear to me particularly important.

When a scheme for a good shunting yard has to be got out, a large number of possible solutions come before one. Now in order to choose the best solution, some term of comparison is required, and this is supplied by the idea of the speed of shunting, I mean the speed at which the trains pass over the gravity hump. Briefly, the best shunting yard is that in which the highest shunting speed can be obtained for a relatively low expenditure. This is self evident.

Starting from this point of view, you will agree with me that the rail-brake is not in itself other than a factor which

helps in carrying out the work. Other factors must be taken into account, and these are the height of fall, the profile, the grouping of the points, and the method of working the points, all acting together as a whole and in concert.

In order that we should form an idea, for example, of the degree of influence of the automatic working of the points, we have in a large modern yard provisionally suppressed the automatic working, and operated all the points by hand; as a result of this the output diminished by from 20 to 30 %.

We should therefore take care to examine the whole of the conditions. It is practically impossible to test experimentally all the imaginable solutions. We have here to deal with the question in a scientific fashion. This is the only way in which good results can be obtained in this field.

These are points upon which I think there should be some discussion.

The President (in French). — I think I should elaborate in the case of several points, what Dr. Gottschalk has just said. He has first of all called our attention to the importance and the value of speed. This is in fact, in every modern yard in which we particularly look for a high rate of output, one of the factors that must be considered and accurately measured. Upon this point we are all in agreement. Moreover we must thank Dr. Gottschalk for having in his report given on this point particulars of all recent developments of a scientific character, all of great interest and which everybody has been able to appreciate.

On the other hand, upon the second of his proposals « investigate the whole of the conditions of a shunting yard », I think that we have not to preoccupy ourselves here with this question which was

already dealt with at the London Congress, especially as regards shunting installations. It was from the point of view of completing the question of shunting installations, that the Permanent Commission at London decided to bring before the present Congress the special question of « methods of reducing the speed ».

I willingly recognise that we must not overlook the conditions that a shunting yard must meet, but on this occasion we must investigate the question that has been put before us, that is « methods of reducing the speed ».

As regards the scientific study of all the methods of doing this, we should certainly agree to state that this should be continued; this moreover, is what is being done in all countries.

Upon the second summary dealing with the various ingenious methods described, we are not yet able to take any position.

The equipments have been too recently put down, and do not appear to be sufficiently perfected for any definite summaries to be made. It is very interesting to give particulars of them all and if the discussion can result in any conclusion on this subject, so much the better, but I am much afraid that it is not yet possible.

Are there any further remarks of a general nature to make ?

Mr. Simon-Thomas, Netherlands Railways (in French). — Mr. President and Gentlemen, before passing on to the discussion of the proposed summaries, I should be obliged if you would allow me to recall briefly to your memory the beginning and the stages passed, in a word, the history of the question with which we are today occupied.

For more than ten years in all coun-

tries, attempts have been made by a more scientific organisation and at the same time a more rational one, to reduce the operating costs of the railways. This is one of the reasons which have caused the question of shunting in the large shunting yards to be gone into more thoroughly.

From the beginning it was appreciated that the construction of the hump, and the organisation of the service should follow certain laws, which, if I may express myself in such a way, should harmonise with the technical appliances available and thereby lead to the desired result. Today, thanks to the discovery of quite new methods for regulating the speed of vehicles shunted off, and for working them to the different sidings of the yard, we can say that valuable results have been obtained, results by which the capacity of the yard is appreciably increased, and which contribute to a real understanding of the costs of operating.

Mr. Frölich was the first in Europe to build successfully a rail-brake controlled from a distance and able to give useful service. Several years later we became acquainted with the Hannauer brake which came from America. In passing it is interesting to note that there was no collaboration between the two inventors, and that Mr. Frölich in Germany, and Mr. Hannauer in America, worked completely independently one of the other. Both built a speed reducing device composed of four moveable check rails; the Frölich rail-brake now known under the name of the « Thyssenhütte brake » has the particular feature of acting automatically according to the weight of the wagons and their load.

This automatic system of braking under the effect of the weight of the wagons, has this advantage, an important one, that it is possible to increase

the braking force without fear of derailment. Furthermore, with this system we get, relatively to the weight of the wagons, the highest braking force with the maximum reduction in speed, and this without damaging the wagons or their contents.

The first time that this apparatus was mentioned, as likewise the modern construction of the hump, was in 1924, at Berlin at the International Congress organised by the German National Railway Company and by the German Institution of Civil Engineers.

In 1925 at the London Congress, I had the honour to raise this interesting question. The whole of the various considerations involved in shunting were mentioned, and dealt with in the summaries numbers 11 and 12, on question III, at the London Congress, to which summaries Mr. Byrom refers in his report. It may be said that from summary No. 12 was born the agenda of the present meeting. In London, the subject was still quite new; today, we can record a quite considerable development.

The first Hannauer rail-brake was put down in 1923 in the Gibson yard. In view of the saving realised by using these brakes, which made it possible to reduce the cost considerably, as compared with the costly method of brakemen, their number grew rapidly. To give you an idea, in 1929 alone, 225 rail-brakes of the Hannauer system were put down in 12 shunting yards.

In Europe the use of rail-brakes of the Frölich system also extended, although brakemen were not used as in America.

We must, however, realise the very weighty advantages which may be added to those enumerated above, resulting from the use of the rail-brake; shunting carried out in all weather conditions;

shunting of a train carried out in a definite manner, and always at the same speed of 1.50 m. (4 ft. 11 in.) per second, conditions which make it possible to organise very fully and with attention to all unusual details, the whole shunting service in a shunting yard. I believe that this matter is the chief reason why these appliances are being more and more frequently used in Europe.

The first Frölich brake was put down in 1917 at Oberhausen in Germany. Since this date 60 « Thyssenhütte » brakes have been put into service, or are under construction. Outside of Germany, 6 installations with 15 appliances have been put down in different countries.

At Hamm, in the Ruhr, in 1925 shunting by entirely mechanical methods was put into service for the first time. I should like to call your attention to the very interesting installation in use since March 1928 at the Duisburg-Hochfeld yard. At this station, on the inclined shunting sidings, there are 3 brakes for regulating the speed of the wagons situated at the beginning of the steepest slope. The need for any brakemen disappears, since, by means of the brake situated at the top of the steepest slope, it has become possible to be master of the shunting. It is particularly interesting to note that even under unfavourable atmospheric conditions, shunting was carried out in a very satisfactory manner. In my opinion an installation of this kind is both economical and definitely preferable to a funicular installation like that in the Dresden yard.

In addition to the Frölich brake, we also find in Germany the Jordan rail-brake and the eddy-current brake of Mr. Bäselér.

The Jordan brake works by compressed

air like the Hannauer brake, built by the « Union Switch and Signal Company ». As the result of tests, Mr. Jordan endeavoured to alter his rail-brake so as to take into account the weight of the wagons as with the Frölich brake. The results of his experiments are not yet available.

The Bäseler rail-brake was laid down in the Magdeburg-Buckau yard at the beginning of 1929. The action of the brake is independent of the weight of the wagons, and consequently it may happen that the load of a wagon lightly loaded may move when braking the wagon.

In addition the Frölich brake is operated hydraulically which gives shorter braking and release times and a better graduated braking than with a brake worked by compressed air.

As regards the means for closing up wagons on the sidings in the yard, by means of road tractors at Blainville, or closing-up tractors at Magdeburg-Rothensee, it seems to me that these machines are no longer required, because in a modernised shunting yard, with entirely mechanised shunting methods, there is no longer any need for such methods of closing up the wagons. Certainly I am satisfied that it is better to equip the yards with entirely mechanical methods of shunting, rather than to spend considerable sums on equipment for closing up the wagons the uselessness of which is clearly shown by the results obtained in yards such as Hamm, Whitmoor, Duisburg-Hochfeld, etc., and of which I have already spoken.

A shunting yard entirely mechanised should be fitted with centralised apparatus for controlling the shunting operations and above all with central automatic point operating equipment, by means of which it is possible to regulate

before the wagons start moving down the hump, the paths through the yard, when shunting trains by gravity. By means of such installations, the shunting can be appreciably speeded up without any fear of derailment. The increasing number of these appliances shows, it seems to me, the very great advantages that the services concerned get from them. Since the first installation at Hamm, in 1929, the « Vereinigte Eisenbahn Signalwerke » apparatus has been fitted to 650 points, 150 of which are automatically controlled.

It is very interesting to note that these moving rail-brakes are being more and more widely used in America as in Europe and that France alone continues to use slipper brakes.

Shortly after fitting the Frölich brake in Germany about the period when America first fitted the Hannauer brake, Mr. Deloison, Chief Yard Master at Lille-la-Déivrance, a station of the Nord Company, built a slipper-brake electrically controlled from a central box.

It would be interesting during this Congress to learn the reason why in France alone slipper-brakes have so much favour.

The use of the slipper has shown itself to be defective in shunting in the large shunting yards, and this demonstration led, especially in Germany, to the invention of the moving rail-brake. The design of the slipper-brake as a method of braking, has been the subject of very full investigations in Germany. From these enquiries, the following observations were recorded :

The uncertainty as to the braking force, especially in winter during frost.

A marked reduction in the action of the brake if the number of axles on a cut is increased. The group used as a trial consisted of an empty wagon followed by two loaded wagons. Running down

a hump with a fall of one metre (3 ft. 3 3/8 in.), the distance travelled during the braking reached 200 m. (656 feet). Under equal conditions the retardation may vary appreciably, sometimes as much as two to one.

The whole of the observations therefore clearly prove that uncertainty of braking is a characteristic feature of the slipper-brake.

Compared to the obsolete Büssing slipper-brake, French slipper-brakes only differ in the method of controlling them, this method being electric in the case of the Deloison apparatus, automatic in that of Cadis. But the principle of braking by slippers remains the same.

I will now sum up and submit to you my personal observations.

In my opinion no useful purpose is served by slipper-brakes at the foot of a hump in large yards; what I said at the London Congress I can only repeat here with more conviction, with more energy: « The system of track brake in which the retarding action is exercised by check rails, automatic and acting according to weight of the wagons is to be preferred to all others. »

The President (in French). — I wish to thank Mr. Simon-Thomas who, while he has completed the interesting data supplied by Mr. Gottschalk, has retraced the history of the track brake, and has given us his personal opinion.

The reasons why the French railways keep to the slipper-brake are set out in the report drawn up by Messrs. Pellarin and Farenc, a copy of which you have all received.

Are there any other remarks?

Mr. Leibbrand, Deutsche Reichsbahn Gesellschaft (in German). — I should like to point out that I interpreted

Mr. Gottschalk's remarks in a way rather different from that they are looked at here. It has been said that these remarks go outside the scope of the question under discussion and that they are concerned with the general layout of shunting yards. I think that this was not Mr. Gottschalk's intention. He rather remarked that not only do the systems for regulating the speed include track brakes, but that the methods for determining the gradient of the hump, the arrangement of the points and their control must also be considered. In my opinion we ought to say in the summary that there are a certain number of systems for regulating the shunting speed, amongst them, the track brakes; we should mention them as otherwise we should run the risk of perhaps omitting some important factors and finally of making clear only a single given point. According to our experience in Germany, we may not proceed in this manner if we wish to remain impartial and not to impede progress.

The President (in French). — I quite agree. Mr. Leibbrand reminds us that the question of the rail-brake which has been so thoroughly gone in to today as regards regulating the movements of wagons in the shunting yards in order to enable the operations to be carried out as quickly as desired is not the only factor to be considered. Quite a number of things have to be studied: profile of the humps and gradients, labour, layout of the sidings, etc.

As Mr. Gottschalk said just now, when these as a whole have been perfected it will make it possible to get the best output from a shunting yard.

Has anyone any further observations to make on the question in general?

Mr. Farenc, *Reporter* (in French). — Mr. Simon-Thomas has just said that the first rail-brake was built in Germany. He will forgive me for pointing out that the first rail-brake with distant control and operated hydrodynamically, was built in 1911. I do not think the German rail-brake was made before that date.

As regards the advantages of the rail-brakes, I do not share Mr. Simon-Thomas' opinion. It is unnecessary to discuss here the advantages of any particular system: as however Mr. Simon-Thomas asks why in France the slipper-brake is preferred, I think his question should be answered. In France we began tests with rail-brakes in 1911. It was just because the results obtained with these rail-brakes did not fully meet requirements that we had to have recourse to the slipper-brakes. If tangible improvements have been made to the rail-brakes we would be ready to use them again, but at present we have not been convinced that they are superior to the other types, and we hope to get still better results from the slipper-brakes.

So far in France we have not come to any final conclusions upon the type of appliance we should adopt. The same would appear to be the case in Germany, where, however the use of rail-brakes appears to be more particularly developed.

From the detailed information given upon this subject in the well documented report of Dr. Gottschalk, it appears to me that no one could draw a final conclusion in favour of the rail-brakes. The lack of decision existing on this subject in Germany is moreover confirmed by the mention in the said report of the tests of a new slipper brake built by Messrs. Thyssenhütte, which firm had specialised on the manufacture of rail-brakes; there would have been no object in making these tests had the superiority

of the rail-brake been incontestably proved.

The President (in French). — Has anyone anything further to say?

Mr. Byrom. — I would like to say in regard to Mr. Fiala's remarks that hand brakes add to the weight of wagons; whilst this is true, it more particularly affects the position on the Continent than that in the British Isles, but it must be remembered that independent brake appliances are required on wagons while running on main lines between point and point, this being quite distinct from the purpose when used for marshalling. They are being used in that case for emergency purposes. With regard to Mr. Simon-Thomas' remarks, I agree with Mr. Farenc that the method of braking either by retarders or slippers is still in the experimental stage.

The President (in French). — This discussion shows that the question is still undecided. Does anyone else wish to speak on the subject?

Mr. Leibbrand (in German). — In summing up the remarks made by Messrs. Simon-Thomas and Gottschalk, I have come to the conclusion that Mr. Simon-Thomas considers that the rail-brake is everything that is good, and that the French feel they should keep to the slipper-brake. In Germany the rail-brake is nothing but a means to an end: there are other things to be considered, such as: coupling up the wagons, closing them up and all measures needed to get the wagons away quickly and to keep to the time table.

The President (in French). — Different equipments have been designed and put into use for this purpose.

Mr. Lamalle, Belgian National Railway Company (in French). — I have some remarks to make on the review of the question Mr. Simon-Thomas has just given us. As regards closing up the wagons mentioned by Mr. Leibbrand, I think this can be left over until we come to number 33. This point cannot be taken as one of general application : it is rather a detail of the summaries and I propose to deal with it again when we come to number 33.

Mr. Pellarin Reporter (in French). — The functions of the brake equipments are quite varied and the part they play in the shunting operations is quite complicated; I think at the present time (and in this I agree with Mr. Farenc) as they are not yet perfected, the question is premature.

The rail-brake can cover many duties and requirements, but it is not yet possible to make any final pronouncement thereon.

Moreover, the Administrations ought to take in hand a thorough investigation especially in the direction of mechanical control which removes the danger now run by the staff, and also in the sense of automatically stopping the wagons on the marshalling sidings; such trials should result in the evolution of a brake, whether rail or slipper, which would meet all needs.

I am in agreement with Mr. Leibbrand when he says that other measures with which we shall deal under number 33 must be provided to ensure wagons being closed up, and the quick formation of the trains so as to be able to increase the output of a shunting yard, which is the final object of the operation.

Mr. Simon-Thomas (in German). — I cannot associate myself with Mr. Leib-

brand's opinion : I consider that if a station be mechanised, further methods for pushing the wagons one against the other become superfluous.

The President (in French). — I think we may consider the general discussion as being closed. I think that everyone is in agreement upon the special report as a whole. We will now pass on to the examination of each of the summaries.

The text of summary 1 will now be read to you.

Summary 1. — The methods employed in marshalling yards to control the speed of vehicles being shunted consist of :

a) Braking appliances fixed to the vehicle (hand brakes);

b) Portable shoes or slippers placed on the running rail or track by hand;

c) Shoes, slippers, or skates placed on the running rail or track by mechanical (including electrical) means, such placing being controlled from a distance;

d) Rail-brakes or retarders parallel to the running rail or track exercising a lateral braking effect on the sides of the wheels of vehicles, such braking being controlled from a distance.

Mr. Gottschalk (in German). — I propose to modify the text under paragraph d) in the following way : after « exercising » add « either a lateral braking effect on the sides of the wheels of vehicles, or a braking effect induced by eddy currents, this braking being controlled from a distance ».

The President (in French). — Before passing on to number 2, in view of Mr. Gottschalk's observations I should like to ask you if something should be added to the beginning of number 1. We actually say « The methods employed in

marshalling yards to control the speed of vehicles being shunted consist of : » . We are only speaking of the method of braking. Should not allusion be made to the scientific layout of the sidings, and to the profile required to assure the shunting being done as quickly as possible; after this we should pass on to the question of braking.

I do not think there should be any objection. The principal question is that of braking, but the arrangement of the yards as well as the gradients are also important.

I therefore suggest that number 1 be re-worded as follows :

« 1. The methods employed in the marshalling yards to control the speed of vehicles being shunted consist of :

A. A rational disposition of the lines and of their profile in order to ensure the most rapid shunting possible.

B. To obtain the necessary slowing down : » — and that we pass on to the text under a), b), etc.

Mr. Gaeremynck, Belgian National Railway Company (in French). — I wonder if, in summary number 1, it would not be advisable to allude to a quite different principle from that of braking of which Mr. Gottschalk speaks in his report.

Instead of giving a certain profile to the hump, a profile required when rail brakes are used, it is possible to imagine, and this is also a practical solution, seeing that tests have been carried out in Germany, a profile not quite so high, by making the bad wagons run more quickly; the good running wagons get on such a profile a sufficiently high speed and no longer require any braking. In this way braking is done away with.

The President (in French). — This is

a very valuable remark. But as this method is quite new and is not used in most shunting yards, I think that this suggestion should form an additional article rather than be introduced into the general terms of the summaries.

Do you still wish anything done under these conditions ?

Mr. Gaeremynck. — I agree.

The President (in French). — In view of this, I think that we agree in wording number 1 as follows :

« 1. The methods employed in marshalling yards to control the speed of vehicles being shunted consist of :

A. A rational disposition of the lines and of their profile in order to ensure the most rapid shunting possible.

B. To obtain the necessary slowing down :

a) Braking appliances fixed to the vehicle (hand-brakes);

b) Portable shoes or slippers placed on the running rail or track by hand;

c) Shoes, slippers, or skates placed on the running rail or track by mechanical (including electrical) means such placing being controlled from a distance;

d) Rail-brakes or retarders parallel to the running rail or track, exercising either a lateral braking effect on the sides of the wheels of vehicles, or a braking effort induced by eddy currents, this braking being controlled from a distance. »

Has any one anything to say on this wording ?

As nobody wishes to speak, I will consider it as approved.

We will now take No. 2 :

Hand brakes a) and portable shoes b) necessitate the personal attendance

or accompaniment of staff for the purpose of applying braking when necessary and to the desired extent.

— Adopted.

The President. — Summary No. 3 :

Distant operated shoes or skates *c*) and rail-brakes *d*) permit of completely or partially centralised control of braking requirements, and enable some reduction in braking staff to be effected.

— Has any one anything to say ?

Mr. Fiala (in French). — Following on what was said during the general discussion and in the reply given by the Special Reporter, I suggest No. 3 be completed as follows :

« The use of slipper-brakes and of rail-brakes makes it possible in certain cases to reduce the number of hand brakes to the strict minimum desirable, and consequently to reduce also the tare weight of the trains. »

The President (in French). — Has any one any observations to make on the subject of this addition ?

Mr. Lamalle (in French). — Is it really necessary to add what Mr. Fiala proposes ? As a matter of principle the hand brake has been condemned and all countries are about to fit the compressed-air brake and the automatic brake.

The President (in French). — Do you not think, Mr. Fiala, that it would be better not to insist upon this point ? Your remark may be a little special but is well founded; your proposal will be mentioned in the report of these proceedings. But I think that it is not desirable to include it in summaries of an international order.

Mr. Fiala. — I agree.

The President (in French). — I think therefore, that we are all in agreement to adopt summary No. 3 as worded by the Special Reporter.

We now come to the summary No. 4 :

In hand and portable shoe braking, the personal contact and individual attention result in the braking responsibility being divided between a number of individuals.

Mr. Renard, French Est Railway (in French). — I do not know if I correctly understand the matter; a wagon fitted with hand brakes after running down the hump should be accompanied by the brakeman who will apply the brake. Consequently it does not seem to me quite exact to say that with this method the responsibility is divided between a certain number of men. It seems on the contrary that the responsibility falls upon the man with the vehicle.

Mr. Byrom. — The meaning of the wording of paragraph 4 is that where hand brakes are used largely, as in England, there are what are termed « brake-runners » in the yard who do not accompany the wagon throughout the length of its journey from the top of the hump till it comes to rest, but the wagon may pass through the hands of two or three men, and therefore the braking responsibility is divided.

The President (in French). — I suggest we add : « In hand or portable shoe braking as practised in England... »

Mr. Gaeremynck (in French). — In America as the different wagons are not braked by the same man, several people are responsible.

The President (in French). — The braking of any individual wagon in America is confided to one man. In England a number of men are placed along the paths to be followed by the wagons. We must only speak about the braking of a particular wagon.

Mr. Gaeremynck (in French). — When the wagons are braked by rail-brakes controlled by one particular box, the operator is responsible.

The President (in French). — When using mechanical brakes some countries also use a number of boxes, sometimes placed one after another. But this is in America and is not general practice but the practice in particular cases.

Are there any other remarks on summary No. 4 ?

— Nobody wishing to speak, summary No. 4 was adopted as slightly modified by the President.

The President (in French). — We now pass on to the examination of summary No. 5.

In distant shoe or rail braking the responsibility is highly concentrated in one or a very few individuals who require to be located in an elevated position commanding a bird's-eye view of the sphere of operations.

— Adopted.

6. At all large yards, where hump or gradient shunting is in operation, or when new yards are contemplated, consideration should be given to the question of conversion to, or the introduction of, distant-controlled shoe braking or rail braking methods.

— Adopted.

7. The difference in conditions, capacity and weight of vehicles in general, in the different countries, combined with the fact that distant-controlled shoe or rail-brakes are largely in their infancy, and are in the process of development and improvement, and the lack of experience of them in certain countries, prevent any general conclusion being reached in favour of a particular type.

— Adopted.

The President. — We now come to No. 8.

The initial cost of introduction or conversion to complete distant-controlled shoe or rail braking is high in comparison with methods employed hitherto, but savings varying in extent in different countries, according to former practices, by the reduction of staff, can be effected, of a permanent and continued character.

— Adopted.

We pass on to No. 9.

The economies can be supplemented by the assembling (where not already done) of the control of point or switch operation in the same location as the shoe or rail-brake control. It is also desirable that the points should be " quick-acting " and it is advantageous at high capacity hump shunting yards for the first sets of points below the hump to be capable of being pre-set electrically and automatically changed by the vehicles themselves.

Has any one anything to say ?

Mr. Pellarin (in French). — I do not know if we can say that it is desirable to put under the same control both points and brakes. This system may be justified in certain places. It is then, however,

a particular case. Moreover I fear that it would be impracticable in some yards.

As regards the second paragraph, I think it is going rather far to say that « it is advantageous » in gravity yards of high output that the first points can be electrically operated in advance.

This would have a certain value if the whole of the points could be set beforehand.

I think no useful purpose is served by this recommendation, and that it would be better to say that if considered useful it could be done. But I do not think that there is any need to make it the subject of a summary.

Mr. Lamalle (in French). — Do you not think it would be of value to note this observation ?

The President (in French). — I think we might, in fact, suppress the passage « where not already done ». I think that everybody would agree to cut out these words.

As regards the second observation we might take it into account by saying « and it may be advantageous in high capacity humping yards... ».

Mr. Gaeremynck (in French). — I should like to ask you, Mr. President, to have the full text read out, taking into account the different alterations made to it.

The President (in French). — « The economies can be supplemented by grouping together the control of point or switch operation in the same location as the shoe or rail-brake control. It may be desirable also that the points should be « quick-acting » and it may be advantageous, at high-capacity hump yards, for the first points below the hump to be

capable of being pre-set electrically and automatically changed by the vehicles themselves. »

Mr. Renard (in French). — If we say : « it may be advantageous for the first points below the hump to be capable of being pre-set automatically and automatically changed by the vehicles themselves », I think we should add : « it may be advantageous for the following sets of points to be changed automatically by the vehicles themselves. »

As they are far away from the pointsmen, and as the vehicles have run a longer distance, there is greater interest in the manoeuvre being automatic. I would like to ask if it would not be possible to add : « it might be of value for the points beyond the first ones to be operated automatically by the vehicles themselves. »

Mr. Simon-Thomas (in French). — It is also advisable that the points should be quick-acting points, so as to enable the cuts to be made at sufficiently high speed. Centralised appliances are necessary, and I will even go so far as to say, automatic centralized appliances.

The President (in French). — We can meet these remarks by saying without altering the text : « and it may be advantageous, in high-capacity shunting yards for the points to be capable of... » the words « below the hump » being deleted.

Mr. Lamalle (in French). — But you would leave in the end of the paragraph.

The President. — Yes.

Mr. Lamalle (in French). — In that case I am in agreement.

The President (in French). — I will read the text as it results from this discussion :

« 9. The economies can be supplemented by grouping together the control of point or switch operation in the same location as the shoe or rail-brake control. It may be desirable that the points should be « quick-acting » and advantageous, at high capacity hump yards, for the points to be capable of being pre-set electrically and automatically changed by the vehicles themselves. »

I think we all agree with this text.

As no observations have been made, I take this last text as agreed.

We will now take No. 10 :

The primary considerations in regard to the gradient for distant-controlled shoe or rail braking are that it shall be such that the worst running vehicle under the most adverse conditions, curvature of track, weather, etc., shall reach the greatest distance required. Also that the preliminary character of the gradient shall be such as to give a sufficiently speedy impetus to vehicles or cuts at the start, so that they are sufficiently separated prior to reaching the points or switches and shall not stop in the point or switching area.

Mr. Simon-Thomas (in French). — I suggest we suppress No. 10 entirely, since it is nothing but a repetition of summary No. 11 on question III of the London Congress.

The President (in French). — It is perhaps not without use to recall it.

Mr. Gaeremynck (in French). — I see no objection to suppressing it.

The President (in French). — It seems to me however, that to repeat it is not

without value. **Mr. Gottschalk** advises me that he is of my opinion.

Mr. Pellarin (in French). — I consider that it is necessary to maintain the clause, because it gives the gradients required to ensure the wagons running to the point required. Moreover this gradient condition, under variable climates especially, necessitates an elevated hump, which causes braking difficulties of which it is not without interest to show the cause.

Mr. Direz, French State Railways (in French). — I think it would be useful to divide No. 10 into two paragraphs A, and B; B, representing the last paragraph, should come first. This would be more logical : it is first of all necessary to give speed to the wagons, then to consider the methods of reducing it. This consideration would be better at the beginning of the text.

The President (in French). — You think therefore that the summary should not be suppressed, but the passage relating to the speed simply brought to the beginning of it, the braking going at the end. If we are all in agreement with this alteration, I suggest the wording be left to the Secretaries.

Mr. Lamalle (in French). — I think this summary is rightly included here. Fundamentally, what we desire to say is that the height of fall, and the gradient, should be sufficient for the wagon to run over the gradient with enough speed to carry it to the desired point. I suggest the text be maintained as it is.

The President (in French). — There would simply be a slight modification in the wording. Do you wish to vote on **Mr. Direz's** proposal ?

Mr. Direz (in French). — It appears to me that it would have been more rational, but I do not insist upon it.

Mr. Byrom. — If No. 10 is retained, it should be left where it is.

The President (in French). — We will keep consequently the summary as it is, and leave it in its present place.

Mr. Gaeremynck (in French). — In this article it says: « The primary considerations in regard to the gradient for distant-controlled shoe or rail-braking »... It is not so much the inclination as the height of fall that is in question.

The President (in French). — The height of fall more than the inclination. Let us put « the gradient... »

Mr. Gaeremynck (in French). — The gradient and height of fall. Let us put the two, *i. e.*, « the height and gradient ».

It is further stated that this gradient (and consequently the height) « shall be such that the worst running vehicle under the most adverse conditions, curvature of track, weather, etc., shall reach the greatest distance required ». The farthest point may possibly be 700 m. (2 300 feet) away. This can certainly be reached when the wagon is not braked at all. But actually the wording said that « for shoe or rail braking ». I think we should suppress the words « the greatest »; all that is necessary is for the worst running wagon to reach the point to which it ought to get to clear the points. Finally it says: « Also that the preliminary character of the gradient shall be such as to give a sufficiently speedy impetus to vehicles or cuts at the start, so that they are sufficiently separated prior to reaching the points or

switches and shall not stop in the point or switching area. » I think we can suppress the passage « and shall not stop in the point or switching area ». There is no danger of them stopping in the neighbourhood of the points if they have been given sufficient speed to run beyond this.

Mr. Pellarin (in French). — It seems to me to be not a bad idea to leave to each one the responsibility for fixing the position that the worst running wagons must reach. The precaution which consists in saying that the wagons must not stop in the points zone, is prudent. It is rather a serious matter and really does not commit anybody, and leaves everyone freedom of action.

Mr. Gaeremynck (in French). — It is really superfluous.

The President (in French). — We might meet the wishes of all by suppressing in the French text the words « le plus éloigné », in the German, « grösser », and in the English, « greatest ».

Are there any further remarks ?

As nobody wishes to speak, No. 10 will be worded as follows :

« 10. The primary considerations in regard to the gradient and height of the hump for distant-controlled shoe or rail braking are that it shall be such that the worst running vehicle under the most adverse conditions, curvature of track, weather, etc., shall reach the full distance required. Also that the preliminary character of the gradient shall be such as to give a sufficient impetus to vehicles or cuts at the start, so that they are sufficiently separated prior to reaching the points or switches and shall not stop in the point or switching area. » (*Adopted.*)

We now come to No. 11 :

The braking pressure needed to absorb the surplus speed when necessary is either highly concentrated as in rail-brakes, or if less concentrated, as in shoe-brakes, more, *i. e.*, a succession of, appliances are needed. Space, therefore, in relation to the general layout, becomes a consideration to be taken into account.

Mr. Farenc (in French). — I suggest we suppress in this text the passages « as in rail-brakes » and « as in shoe-brakes ».

In fact it has not been proved in any way that slipper-brakes have a less concentrated pressure than the rail-brakes.

The pressure depends upon the type adopted. The recommendation may be equally well applied to the rail-brake as to the slipper-brake.

Mr. Lamalle (in French). — In the present state of braking, the slipper-brake acts on one pair of wheels and the rail-brake may act on several. Consequently for an equal load, the slipper-brakes require a longer distance. The present state of braking wagons is made clear by this paragraph.

Mr. Farenc (in French). — You are thinking of a slipper which only brakes the leading pair of wheels. There are slipper-brakes which are able to brake the first pair of wheels of each wagon. If we keep the article as it is, you support a principle which tomorrow may be falsified. With certain slipper-brakes the first pair of wheels of the rake is braked, with others you can brake several pairs of wheels.

For example, with the type of slipper-brake used on the French Midi Railway, it is possible to brake each pair of wheels with each appliance; actually the first pair of wheels of each wagon is all that

is braked. It is moreover not true that the action of the slipper-brake on a pair of wheels is less powerful than that of the rail-brake.

Mr. Lamalle (in French). — But if the first pair of wheels braked by a slipper belongs to an empty vehicle ?

Mr. Pellarin (in French). — When there are several vehicles the objection falls. And moreover, tomorrow there may be several systems showing greater advantages. All the rail-brakes have not great braking power. They do not have a braking power proportional to the weight, they cannot always have excessive braking power especially if a rake of wagons be run through them; it is necessary for the brakes to regulate it in such a way that an empty wagon does not jump the track. And if the brake is regulated for the empty wagons, the brake action will be almost negligible on the loaded wagons, which require much greater power.

The President (in French). — Mr. Lamalle do you maintain your proposal, or should we vote on Mr. Farenc's proposal to suppress the passages : « as in rail-brakes » and « as in shoe-brakes ».

Mr. Lamalle (in French). — I do not insist; I simply keep my opinion.

Mr. Farenc (in French). — Saying « the braking pressure should be as concentrated as possible », all appliances are covered.

Mr. Lamalle (in French). — We who are present will understand the matter, but the reader who has not been present at the discussion will not.

Mr. Farenc (in French). — We might

say « And if the slipper-brakes are less concentrated, a large number is required. »

The President (in French). — It would be possible to say : « or if their action is less concentrated in certain arrangements, a greater number is necessary. »

Mr. Pellarin (in French). — With the rail-brakes, if too great pressure is applied to an empty wagon, it will be derailed. We have tried to regulate the pressure, and the retarding action is very much limited by the risk of the empty wagon mounting on the brake rail. We have been obliged to add to the rail-brake a curved steel plate guard so as to avoid possible accidents. I agree with Mr. Farenc when he says that it is unreasonable to pretend that the braking with the rail-brake is concentrated and that with the slipper-brake it is not.

I would like to call the attention of the Meeting upon another point in the report I drew up with Mr. Farenc. The object of braking is to reduce any excess of speed of the vehicles. There is also another function that the brake may exercise : that of regulating the speed of the wagons so as to maintain between them the interval required for operating the points. If the braking effort is concentrated on a single appliance, it is very difficult to obtain this action, whereas, with appliances placed at intervals, it is possible in modifying the speed to obtain the second object. By regulating the speed it is possible to set the points between two successive wagons.

It might be well to add something on this subject in the text to indicate that it is very desirable in many cases to have a certain number of brakes capable of regulating the speed of the wagons.

The President (in French). — This is a proposal which reopens summary No. 1.

Mr. Byrom. — I suggest that summaries Nos. 11, 12 and 13 be deleted, No. 14 being retained as No. 11.

Mr. Lamalle (in French). — I ask your excuses for prolonging the discussion, but I think that this is a point that has not been sufficiently brought before us. I believe that a test carried out in Germany shows that when the height of fall is sufficient, and the down gradient steep enough, the wagons start away with a speed sufficiently alike, and that the first brake is then not needed. As regards the good or the bad runner, it is sufficient to use the brake at the end of its journey.

The President (in French). — I propose to replace Nos. 11, 12, and 13 by a phrase which does not pass over in silence the question raised; this it is :

« The choice between braking appliances with which the braking action is much concentrated, and those with the braking action distributed, the value of which some appreciate because of the greater ease with which it is possible to separate the wagons, etc... »

Mr. Miclesco, Rumanian State Rys. (in French). — If No. 11 be modified in this sense, I think it could remain as proposed by the Special Reporter.

If the brakes are not sufficiently strong, they ought to be distributed.

The President (in French). — Mr. Pellarin says that there are cases where brakes with too concentrated action are not required, but where it is necessary to be able to distribute the brakes so as to regulate the speed.

Mr. Farenc (in French). — The interest of this paragraph is to show that in the general layout of the yard the space available ought to be taken into account so as to be able to provide a series of appliances as provided for in summary No. 14.

Mr. Miclesco (in French). — We might put « If the necessary braking pressure to absorb, if need be, the excess of speed is less concentrated, a greater number of appliances and consequently a succession of appliances is needed ».

Mr. Pellarin (in French). — The following is the text I would like to put before you : « The necessary brake pressure to absorb, if required, the surplus speed can be concentrated or spread out through several appliances according to the power of the type employed.

The space available could be taken as the predominating factor as to the type of apparatus to adopt. It may be necessary, even with a very powerful type of apparatus, to possess several series of brakes in order to regulate the speed during the run from the hump and to maintain the space between wagons of a different co-efficient of running. »

The President (in French). — Before voting on this text, I think I should remark that the discussion bears on the point as to whether the very concentrated appliances are rail-brakes and those not so concentrated are slipper-brakes. The text proposed would be more easily adopted if we did not say « rail-brakes » and « slipper-brakes »; if we said « very concentrated appliances, and appliances not so concentrated », without mentioning the types. As for Mr. Pellarin's proposal relative to the distribution of the braking all along the zone, it is necessary to know if we agree to mentioning it.

I will ask you to vote on the wording proposed by Mr. Pellarin. This wording appears to me one to meet all objections. Do we agree to adopt the summary 11, as proposed by Mr. Pellarin.

Mr. Leibbrand (in German). — We cannot properly say that the space available should have the greatest weight in deciding the type of appliances to be adopted. Provision must be made to provide the room needed for the type of appliance, not the contrary.

Mr. Lamalle (in French). — That is the reason for the second paragraph, and it is just upon the second point that there appears to be little agreement. I consider that we should let this second point drop.

The President (in French). — As regards the first point there is no disagreement, but upon the second dealing with the value of regulating the movements of the wagon are there any objections ?

Mr. Gaeremynck (in French). — The objection is the following : if the hump is sufficiently high and steep to give the vehicles a regular speed, so that their running is more or less the same, there is no need for this braking.

Mr. Pellarin (in French). — The calculation of the height of hump required to immediately separate the vehicles, is a matter of elementary mechanics. It is necessary to take into account the distance the vehicles have to run before coming to the marshalling sidings. This depends upon the size of the fan of sidings. In the case of certain kinds of sidings, and I have known them to have as many as 47 lines, there is a zone of points which extends over a considerable distance; it has been observed that when

running down a hump with a gradient of 60 mm. per metre (1 in 17), vehicles overtook one another.

Mr. Farenc (in French). — It may be necessary to have brakes to space out the wagons.

The President (in French). — There are cases in which that is necessary. The text of the special report is therefore turned down, and the new text put forward by Mr. Pellarin is as follows :

« 11. The necessary brake pressure to absorb, if required, the surplus speed can be concentrated or spread out through several appliances according to the power of the type employed.

« The space available could be taken as the predominating factor as to the type of apparatus to adopt. It may be necessary, even with a very powerful type of apparatus, to possess several series of brakes in order to regulate the speed during the run from the hump and to maintain the space between wagons of a different co-efficient of running. »

Do we agree upon this wording ?

— The wording was approved.

We will now pass to No. 12 :

The shoe-brake acts on one wheel of a vehicle only, *i. e.*, the leading wheel which mounts the shoe — hence a succession of appliances is generally required for this type.

and to No. 13 :

The rail-brake exerts lateral braking on the sides of all the wheels. Comparatively fewer appliances are therefore required. The length of the brake rails and the number are governed by the

character and weight of the rolling stock in the particular country.

Mr. Byrom. — If article 11 is to be retained, Nos. 12 and 13 should also stand.

The President (in French). — No. 11 has been modified. Under these circumstances, I. will again consider Mr. Byrom's proposal to suppress Nos. 12 and 13 which are included in the new No. 11.

Do we agree to suppress Nos. 12 and 13 ?

— No objection was raised.

We will now take No. 14 which will become No. 12, and also No. 15, the new No. 13.

14. In shoe-brake installations, the first set is usually placed at the foot of, or immediately below the first or steepest part of the gradient with as many more sets as may be necessary, on the leads into the groups of sorting sidings, with a further set at the commencement of each of the individual sidings clear of the point or switching area.

and also No. 15 (which would become No. 13).

15. In purely rail braking installations the brake rails, one set or more as necessary, are usually located in the leads to the various groups of sidings only.

Mr. Gottschalk (in German). — Summary No. 14 applies not only to the slipper-brake, but to all systems of brakes, and I propose to alter the text in consequence.

Mr. Farenc (in French). — In summary 13, rail-brakes are dealt with.

The President (in French). — If we adopt Mr. Gottschalk's proposal, summary No. 15 can be allowed to fall out.

Mr. Gottschalk (in German). — I propose to suppress the distinction between the slipper-brake and the rail-brake and to suppress No. 15.

Mr. Byrom. — Agreed.

Mr. Farenc (in French). — When installing rail-brakes no brakes are put down at the end of the run, not because the system makes them unnecessary, but because if they were wanted, it would be necessary to install these appliances on each line, and this would be too expensive. It is, therefore, for reasons of economy that it is not done.

I should be prepared to admit that, in principle, in braking installations provision is made for the three groups indicated by Mr. Gottschalk. And it is in this way that I should prefer to see summary 15 modified, by adding at the end of it that it is for reasons of economy that braking at the end of the run is not provided for when rail-brakes are used.

Mr. Sherrington, London & North Eastern Ry. — In England, at our Whitmoor Yard, 4 Frölich rail-brakes are in use in our leads to the various groups of sidings and they have given entire satisfaction.

The President (in French). — I think we could sum up the discussion of these two articles as follows :

Mr. Gottschalk proposes to maintain paragraph 14 replacing « installations of slipper-brakes » by « braking installations ».

Mr. Farenc completes this by saying that it is an arrangement desirable « in principle ».

Mr. Gottschalk proposes to suppress No. 15.

Mr. Farenc, on the contrary, proposes under No. 15 to say that rail-brakes as a rule are not usually placed, for reasons of economy, anywhere but at the beginning of the different groups of sidings, etc.

I put to the vote summary 14 as completed by Mr. Gottschalk.

— Unanimously adopted.

— The Section then voted in favour of retaining summary 15 as modified by Mr. Farenc.

The President (in French). — The summaries will therefore be worded as follows :

« 12 (formerly 14). In principle, in mechanical brake installations, the first set is usually placed at the foot of, or immediately below, the first or steepest part of the gradient with as many more sets as may be necessary, on the leads into the groups of sorting sidings, and with a further set at the commencement of each of the individual sidings clear of the point or switching area. »

« 13 (formerly 15). In purely rail braking installations the brake rails, one set or more as necessary, are usually located in the leads to the various groups of sidings only. »

We now come to summary No. 16.

The greater the extent to which braking power, with the necessary elasticity of application, can be concentrated in the fewest appliances, the less staff of operators is required, so that the work can be speeded up, as an operator instead of having to watch a vehicle or cut through a succession of brakes, can the sooner turn his attention to the next oncoming vehicle or cut.

— Adopted as the new No. 14.

Summary 17 :

Certain forms of rail-brake make it possible to obtain a braking force proportional to the weight of the vehicle or cut, which is an advantage, provided the construction is such that light vehicles are not lifted out when pressure is applied.

— Adopted, this summary will be No. 15.

Summary 18 :

The initial cost of such rail braking appliances is comparatively high and necessitates certain standard features of design of layout of track, *i. e.* the balloon-shaped formation, with points or switches at more or less equal radii from the hump.

— Adopted, under the new No. 16.

No. 19. The initial cost of shoe braking apparatus is stated to be appreciably less and in suitable instances may be applied to existing layouts.

Are there any remarks ?

Mr. Farenc (in French). — It would perhaps be better to put in summary 19, « in most cases » instead of « in suitable instances », but I do not insist on this.

The President (in French). — We could perhaps put in summary 18 « is at present comparatively high » and leave « in suitable instances » instead of « most cases ». Has anyone any objection to raise to these modifications, which relate to the future ?

— No objections having been made, summary 16 (old 18), will be worded as follows :

« 16 (formerly 18). The initial cost of such rail braking appliances is at present comparatively high and necessitates certain standard features of design of lay-

out of track, *i. e.* the balloon-shaped formation, with points or switches at more or less equal radii from the hump.

In summary 19 (new 17) we will therefore keep the passage « in suitable instances ».

— Agreed.

We come to No. 20 :

Certain types of rail-brake are of such length that brake pressure can be increased or decreased at will as vehicles or cuts of vehicles are passing through them.

— Adopted as the new No. 18.

Summary 21 :

With the shoe-brake there is not the same facility, as once the wheel has mounted the shoe the pressure is constant until the shoe leaves the track at what is a fixed position or cut-out.

— Adopted as the new No. 19.

Summary 22 :

One form of shoe-brake has its normal rest position at the lower end of the brake area and is propelled towards an oncoming vehicle to the pre-judged distance necessary by the operator at will.

— Adopted. Will be No. 20.

Summary 23 :

Another form of shoe-brake has its normal rest position at the higher or commencing end of the braking area and operator as necessary and provides for the return of the shoe to the starting may be placed on the rail at will by the point automatically.

— Adopted as the new No. 21.

Summary 24 :

Rail brakes may be operated electrically, hydraulically, pneumatically, or

magnetically, or in part combination, and control of the apparatus is effected electrically.

Mr. Farenc (in French). — I think it would be better in summary 24 to put « may be operated or controlled ». There are certain appliances which are actuated and controlled hydraulically.

Mr. Simon-Thomas (in French). — I do not know if it is possible to control them magnetically.

The President (in French). — Yes, by a magnetic relay. I believe that we could suppress, however, « magnetically » which is included in « electrically ». With this reserve we are agreed, I think, to word summary No. 24 as follows :

« 22 (formerly 24). Rail-brakes may be operated or controlled electrically, hydraulically, or pneumatically, or in part combination. »

— Approved.

We will now take No. 25.

A purely automatic shoe braking appliance governed by the speed and weight of vehicles approaching and by the extent of occupation of the siding to be entered is in the experimental stage but this as yet appears to necessitate every wagon being shunted separately.

Mr. Pellarin (in French). — Experience shows, however, that it is possible to handle two wagons at a time.

The President (in French). — We will take this into account and modify as follows, the wording of this summary :

« 23 (formerly 25). A purely automatic shoe braking appliance governed by the speed and weight of vehicles approaching and by the extent of occupation of the

siding to be entered is in the experimental stage but this as yet appears to necessitate limiting to two at a time the number of vehicles being shunted.

— Approved.

Summary 26 :

In all forms of distant controlled shoe braking and rail braking, it is desirable for the operator to be furnished with a « cut list » giving a list of the vehicles, the siding for which each is destined, whether loaded or empty, or containing fragile goods or otherwise and other special features (if any).

Mr. Farenc (in French). — A list of cuts is not always prepared. Sometimes all that is done is to indicate the numbers of the sidings to which the wagons will be sent, without it being necessary to draw up a list.

The President (in French). — This is evident. The operator ought to know where a wagon should be sent. This may be a question of interest to deal with, but not today. I would rather suppress this summary than deal with anything that does not relate to braking. Has the reporter any objections to make ?

Mr. Byrom. — No.

The President (in French). — If everyone agrees, we will suppress No. 26, not because it has no value, but solely because it deals with a matter at present not under consideration.

— Agreed.

We thus come to summary 27 :

Flood lighting of modern type is desirable for all large marshalling yards and particularly where rail braking or shoe braking methods are in force.

Mr. Lamalle (in French). — I should like to know precisely what is meant by « flood lighting ». This expression while a simple one, is not very explicit. The flood light might be horizontal, at an angle, etc. It would be therefore well to be more precise in the description.

The President (in French). — I do not think any explanation would in any way detract from the principle.

Mr. Lamalle (in French). — Seeing that the summary will be adopted, it is desirable that everyone should know what is meant by flood lighting.

The President (in French). — This is a method of lighting by projectors limited to a small number of very powerful projectors giving a horizontal lighting, increasing the contrast and the shadows and facilitating the lighting up of apparatus at the greatest distance. At sunset when the rays are very flat, they increase perceptibility of distant objects.

Mr. Lamalle (in French). — In Belgium we have also lighting by means of projectors. But we have here an expression upon the significance of which it is desirable to be in agreement.

Mr. Byrom. — We might say : « a sufficient lighting arrangement ».

Mr. Lamalle (in French). — I am not opposed to the idea, but I would like the terms used to be more precise.

The President (in French). — We have before us two propositions: to make the word « flood lighting » more definite, or replace the expression by the words « sufficient lighting ». Do we agree to put « sufficient lighting »?

— As no objection is raised, we will word summary 25 (formerly 27) as follows :

« 25 (formerly 27). A sufficient lighting arrangement of a modern type is desirable for all large marshalling yards, and particularly where rail braking or shoe braking methods are in force. »

Next comes summary 28 :

Colour light signalling providing a suitable code is advantageous for controlling speed of hump operations, being duplicated as necessary and supplemented by oral code signals such as electric or klaxon horn if required.

Mr. Gottschalk (in German). — I do not see any necessity for recommending coloured light signals; in my report I have described in fact, other systems which have given satisfaction. I am drawing up a text which will put before you shortly.

The President (in French). — While waiting we could leave on one side this summary, and take No. 29, as follows :

Pneumatic tubes for the transmission of cut lists or other documents afford a desirable means of expediting the conveyance of train papers, cut lists, etc., between the essential posts in the yard.

Mr. Pellarin (in French). — I think that this text is too limited when it says « pneumatic tubes ». It would be better to put « mechanical means for the transmission ».

The President (in French). — Do we agree to alter the text in this way?

— No one wishing to speak, summary 29 (now 27) will be worded as follows :

« 27 (formerly 29). Mechanical means

for the transmission of cut lists or other documents afford a desirable means of expediting the conveyance of train papers, cut lists, etc., between the essential posts in the yard. »

Mr. Gottschalk has given me the wording he suggests in replacement of the old No. 28; it is as follows :

« 26 (formerly 28). Luminous signaling devices providing a suitable code is advantageous for controlling speed of hump operations, being duplicated as necessary and supplemented by oral code signal such as electric or klaxon horns if required. It is found desirable to develop increasingly the systems which allow of the chief foreman controlling the train.

Mr. Lamalle (in French). — It seems to me that there is very little in it as indicated.

The President (in French). — We might say in the second part: « It is found desirable to develop increasingly the systems which allow of the chief foreman directing operations, to order himself the movements of wagons from the train about to be shunted. »

Mr. Lamalle (in French). — I agree.

Mr. Gottschalk, also approves this fresh suggestion.

The President (in French). — If everybody agrees, the summary 26 will be worded in this way.

— Approved.

Summary 30 :

Electric teletype machines afford a ready and expeditious means of transmitting at one operation the switching or cut lists and of giving instructions

to the rail-brake and point or switch operators' cabin and other parts of the yard as necessary.

— Adopted as the new No. 28.

Summary 31 :

Loud speaker telephones for verbal messages are of considerable benefit for rapid communication between certain key positions in a hump yard.

— Adopted as No. 29.

32. In general, the advantages claimed for distant-controlled braking methods embrace some, if not all, of the following advantages, according to local circumstances, and the particular type of apparatus used :

a) Reduction in number and cost of brakemen;

b) Damage to goods and rolling stock diminished, with consequent reduction in claims and maintenance costs;

c) Increased safety of employees;

d) Slow working due to adverse weather conditions is counteracted;

e) Operating capacity of yards is enlarged;

f) Closing of small yards by concentrating the work at one large yard;

g) Certain yards closed during part of the 24 hours;

h) Reduction in locomotive-hours;

i) Avoidance of employment of extra staff in bad weather.

Mr. Pellarin (in French). — It is possibly rather sweeping to say in paragraph d) in the French text that « le ralentissement... n'est plus à craindre ».

The President (in French). — I thought the same thing, and have noted down an alteration saying that the slowing down is « moins à craindre ».

Mr. Lamalle (in French). — The paragraph *i*) is also too categorical.

The President (in French). — Under *d*) we could put, I think, « est moins à craindre » (« is counteracted »).

— Approved.

Mr. Ashworth. — This is how it is worded in the English text.

The President (in French). — I agree.

As a result of the alterations made to *d*), the clause *i*) could be suppressed.

Mr. Pellarin (in French). — It is undoubtedly necessary to introduce some modifications in this summary. When the work is done in the old way, a large number of men is required. In the height of summer, work is only done during sixteen hours per day. If the weather becomes bad, and if the traffic increases, it is necessary to increase the staff by 50 %.

As a result of using improved braking equipment, the staff can be reduced, and if the operation of the points is concentrated instead of 8 or 10 men, only 2 or 3 are used. By using automatic appliances, one may possibly avoid using any. In this connection there are therefore facilities which it may perhaps be as well to bring out.

The President (in French). — Paragraph *i*) becomes less important.

Mr. Renard (in French). — I think that Mr. Pellarin's idea is not completely understood. Additional staff may be required in the event of bad weather or a sudden rush of traffic.

In this event it becomes necessary to increase the number of working hours. I think it would be better to insert a

paragraph between *g*) and *h*), saying « Employment of extra staff in bad weather, or when extra shunting has to be done, becomes less important ».

The President (in French). — Are we all agreed? In this case we will cut out paragraph *i*). Paragraph *h*) will become *i*), and the addition proposed by Mr. Renard will take the place of *h*).

In brief, from the commencement of the text until paragraph *c*), no alteration is made. The paragraph *d*) will be worded as follows : « *d*) le ralentissement des opérations dû à des conditions atmosphériques défavorables est moins à craindre » (« slow working due to adverse conditions is counteracted »).

The paragraph *i*) is suppressed, paragraph *h*) becomes *i*) and under *h*) we say : « Employment of extra staff in bad weather or when extra shunting has to be done becomes less important. »

— The Section agreed to these alterations.

The President (in French). — We will now take No. 33 :

In certain instances where space permits, economical use has been made of small road tractors capable of running between the different sidings and crossing the rails when necessary, for the purpose of propelling or hauling one or more rail vehicles at a time and closing up vehicles on shunting sidings.

Mr. Gottschalk (in German). — It would be as well to delete the word « road ».

The President (in French). — I agree. We will say : « small tractors capable of running, etc... »

It will be necessary now to add a summary No. 34 dealing with the methods

of increasing the speed about which Mr. Gaeremynck spoke just now.

This wording might be inserted between the old numbers 25 and 27 in place of No. 26 which has been cut out.

Mr. Gaeremynck (in French). — I would like to say a word of explanation on the subject of No. 33. There are two sorts of tractors: one running on roadways, the other on narrow gauge tracks. Can the wagons be closed up during shunting operations, or must the work be stopped? When a tractor runs on rails, it remains within the loading gauge. If it is on a pathway, I would like to know if the driver has any hesitation in using it, or if he is afraid, or if it is dangerous for him?

Mr. Pellarin (in French). — The work is continued while shunting operations are being carried out. The space between the track is wide enough. The distance between centres is 5 m. (16 ft. 5 in.); between two parallel tracks, there is 1.80 m. (5 ft. 11 in.) free space. The tractors are about 1 metre (3 ft. 3 3/8 in.) wide. The driver continues to work while shunting is going on; as he can see the illuminated board showing the track being used, he has no hesitation in crossing the line. And I should add that during the 5 years that we have used this method of closing up the wagons (and this is done in 4 large yards), we have not had a single accident. When the tractor has to cross the line, the man who goes with it to close up the wagons stands about 40 to 50 m. (130 to 160 yards) before it with a slipper.

The President (in French). — I think I ought to sum up the summaries. I will not take all the points, but limit myself

to the principal ones, so as to make sure that we are all in agreement. They are as follows:

In large shunting yards from an economical point of view the highest possible shunting speed must be obtained, and a method of reducing the speed becomes necessary because the profile should be such that the worst runner shall still run even in the worst weather on to the marshalling sidings.

It therefore becomes necessary to slow down in good weather the wagons, especially the best runners, to separate them, and to avoid shock.

Braking by hand or with separate slippers is expensive, and is not free from danger.

Mechanical braking with distant control is to be preferred.

The present methods may be classified under two main groups: rail-brakes; slipper-brakes.

So far experience does not enable any choice to be made between these methods, and the different types of equipment, some of which, in spite of the great ingenuity displayed, still require to be perfected.

The methods by which the wagons are accelerated also merit special study.

The methods of lighting, signalling, and transmission should be brought to perfection in connection with the methods of shunting and braking.

Distance control of the points is to be recommended and, in certain cases, their automatic control.

Wagons on the marshalling sidings can be more easily closed up by mechanical equipment or tractors, running on rails or pathways. (*Applause.*)

— The meeting closed at 1.20 p. m.

DISCUSSION AT THE GENERAL MEETING.

Meeting held on the 10 May 1930 (morning).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.

GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.

ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF
AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary*. — Gentlemen, we will now discuss the summaries of question X as published in the *Daily Journal of the Session*.

Does anybody wish to speak upon the summaries which have been agreed ?

— No observations were made.

Mr. Ghilain (in French). — We will therefore consider these summaries as adopted.

The President. — The summaries are as follows :

SUMMARIES.

« 1. The methods employed in marshalling yards to control the speed of vehicles being shunted consist of :

« A. A rational disposition of the lines and of their profile in order to ensure the most rapid shunting possible.

« B. To obtain the necessary slowing down :

« a) Braking appliances fixed to the vehicle (hand brakes);

« b) Portable shoes or slippers placed on the running rail or track by hand;

« c) Shoes, slippers, or skates placed on the running rail or track by mechanical (including electrical) means, such placing being controlled from a distance;

« d) Rail-brakes or retarders parallel to the running rail or track, exercising either a lateral braking effect on the sides of the wheels of vehicles, or a braking effort induced by eddy currents, this braking being controlled from a distance.

« 2. Hand brakes a) and portable shoes b) necessitate the personal attendance or accompaniment of staff for the purpose of applying braking when necessary and to the desired extent.

« 3. Distance-operated shoes or skates c) and rail-brakes d) permit of completely or partially centralised control of braking requirements, and enable some reduction in braking staff to be effected.

« 4. In hand and portable shoe braking, as practised in England, the responsibility may be divided between a number of individuals.

« 5. In distance shoe or rail braking

« the responsibility is concentrated in
« one or a very few individuals who re-
« quire to be located in an elevated posi-
« tion commanding a bird's-eye view of
« the sphere of operations.

« 6. At all large yards, where hump
« or gradient shunting is in operation
« or when new yards are contemplated,
« consideration should be given to the
« question of installing distance-con-
« trolled shoe or rail braking methods.

« 7. The difference in conditions, ca-
« pacity and weight of vehicles in gen-
« eral, in the different countries, com-
« bined with the fact that distance-con-
« trolled shoe or rail-brakes are in the
« process of development and improve-
« ment, and the lack of experience of
« them in certain countries, prevent any
« general conclusion being reached in
« favour of a particular type.

« 8. The initial cost of introduction or
« conversion to complete distance-con-
« trolled shoe or rail braking is high
« in comparison with methods employed
« hitherto, but savings varying in extent
« in different countries, by the reduction
« of staff, can be effected, of a perma-
« nent and continued character.

« 9. The economies can be supple-
« mented by grouping together the con-
« trol of point or switch operation in
« the same location as the shoe or rail-
« brake control. It may be desirable
« that the points should be « quick-
« acting » and it is advantageous, at
« high capacity hump yards, for the
« points to be capable of being pre-set
« electrically and automatically changed
« by the vehicles themselves.

« 10. The primary considerations in
« regard to the gradient and height of
« the hump for distant controlled shoe

« or rail braking are that it shall be such
« that the worst running vehicle under
« the most adverse conditions, curvature
« of track, weather, etc., shall reach the
« full distance required. Also that the
« preliminary character of the gradient
« shall be such as to give a sufficient
« impetus to vehicles or cuts at the start,
« so that they are sufficiently separat-
« ed prior to reaching the points or
« switches and shall not stop in the point
« or switching area.

« 11. The necessary brake pressure to
« absorb, if required, the surplus speed
« can be concentrated or spread out
« through several appliances according
« to the power of the type employed.

« The space available could be taken
« as the predominating factor as to the
« type of apparatus to adopt. It may be
« necessary, even with a very powerful
« type of apparatus, to possess several
« series of brakes in order to regulate
« the speed during the run from the
« hump and to maintain the space be-
« tween wagons of a different co-effi-
« cient of running.

« 12. In principle, in mechanical brak-
« ing installations, the first set is usually
« placed at the foot of, or immediately
« below, the first or steepest part of the
« gradient with as many more sets as
« may be necessary, on the leads into the
« groups of sorting sidings, and with a
« further set at the commencement of
« each of the individual sidings clear of
« the point or switching area.

« 13. In purely rail braking installa-
« tions the brake rails, one set or more
« as necessary, are usually located in
« the leads to the various groups of
« sidings only.

« 14. The greater the extent to which
« braking power, with the necessary

“ elasticity of application, can be concentrated in the fewest appliances, the less staff of operators is required, so that the work can be speeded up, as an operator, instead of having to watch a vehicle or cut through a succession of brakes, can the sooner turn his attention to the next oncoming vehicle or cut.

“ 13. Certain forms of rail brake make it possible to obtain a braking force proportional to the weight of the vehicle or cut, which is an advantage, provided the construction is such that light vehicles are not lifted out when pressure is applied.

“ 16. The initial cost of such rail braking appliances is at present comparatively high and necessitates certain standard features of design of lay-out of track, *i. e.* the balloon-shaped formation, with points or switches at more or less equal radii from the hump.

“ 17. The initial cost of shoe braking apparatus is stated to be appreciably less and in suitable instances may be applied to existing layouts.

“ 18. Certain types of rail-brake are of such length that brake pressure can be increased or decreased at will as vehicles or cuts of vehicles are passing through them.

“ 19. With the shoe-brake there is not the same facility, as once the wheel has mounted the shoe the pressure is constant until the shoe leaves the track at what is a fixed position or cut-out.

“ 20. One form of shoe-brake has its normal rest position at the lower end of the brake area and is propelled towards an oncoming vehicle to the pre-judged

“ distance necessary, by the operator at will.

“ 21. Another form of shoe-brake has its normal position at the higher or commencing end of the braking area and may be placed on the rail at will by the operator as necessary and provides for the return of the shoe to the starting point automatically.

“ 22. Rail-brakes may be operated or controlled electrically, hydraulically or pneumatically, or in part combination.

“ 23. A purely automatic shoe braking appliance governed by the speed and weight of vehicles approaching and by the extent of occupation of the siding to be entered is in the experimental stage but this as yet appears to necessitate limiting to two at a time the number of vehicles being shunted.

“ 24. Another appliance of interest which is at present being tried out is an accelerator which gives an additional impulse to badly running wagons or during unfavourable atmospheric conditions.

“ 25. A sufficient lighting arrangement of a modern type is desirable for all large marshalling yards, and particularly where rail braking or shoe braking methods are in force.

“ 26. Luminous signalling devices providing a suitable code is advantageous for controlling speed of hump operations, being duplicated as necessary and supplemented by oral code signal such as electric or klaxon horns if required. It is found desirable to develop increasingly the systems which allow of the chief foreman directing operations to order himself the move-

« ments of wagons from the train about
« to be shunted.

« 27. Mechanical means for the trans-
« mission of cut lists or other documents
« afford a desirable means of expediting
« the conveyance of train papers, cut
« lists, etc., between the essential posts
« in the yard.

« 28. Electric teletype machines afford
« a ready and expeditious means of
« transmitting at one operation the
« switching or cut lists and of giving
« instructions to the rail-brake and point
« or switch operator's cabin and other
« parts of the yard as necessary.

« 29. Loud speaker telephones for ver-
« bal messages are of considerable bene-
« fit for rapid communication between
« certain key positions in a hump yard.

« 30. In general the advantages claim-
« ed for distance-controlled braking me-
« thods embrace some, if not all, of the
« following advantages, according to lo-
« cal circumstances and the particular
« type of apparatus used :

« a) Reduction in number and cost
« of brakemen;

« b) Damage to goods and rolling
« stock diminished, with consequent re-
« duction in claims and maintenance
« costs;

« c) Increased safety of employees;

« d) Slow working due to adverse
« weather conditions is counteracted;

« e) Operating capacity of yards is
« enlarged;

« f) Closing of small yards by con-
« centrating the work at one large yard;

« g) Certain yards closed during part
« of the 24 hours;

« h) Employment of extra staff in bad
« weather, or when extra shunting has
« to be done, becomes less important;

« i) Reduction in locomotive-hours.

« 31. In certain instances where space
« permits, economical use has been made
« of small tractors capable of running
« between the different sidings and
« crossing the rails when necessary, for
« the purpose of propelling or hauling
« one or more vehicles at a time and
« closing up the vehicles which have
« been shunted. »

QUESTION XI.

SIGNALLING OF LINES FOR FAST TRAFFIC AND IN MAIN STATIONS. DAYLIGHT SIGNALS. AUTOMATIC BLOCK SYSTEM.

Preliminary documents.

1st report (America, the British Empire, China and Japan), by Mr. G. H. DRYDEN. (See *Bulletin*, September 1929, p. 1805 or separate issue No. 24.)

2nd report (other countries, except Belgium, France, Italy, Portugal, Spain and their colonies), by Mr. J. KRISTENSEN. (See *Bulletin*, December 1929, p. 3153 or separate issue No. 50.)

3rd report (Belgium, France and their Colonies), by Mr. G. C. A. WILLAERT. (See

Bulletin, February 1930, p. 723 or separate issue No. 65.)

4th report (Italy, Portugal, Spain and their Colonies, by Messrs. A. GIBERT and J. NOUËS. (See *Bulletin*, April 1930, p. 1161 or separate issue No. 72.)

5th report (Germany), by Mr. W. STÄCKEL. (See *Bulletin*, March 1930, p. 997 or separate issue No. 69.)

Special Reporter : Mr. W. STÄCKEL. (See *Bulletin*, May 1930, p. 1448.)

DISCUSSION BY THE SECTION.

Meeting held on the 9 May 1930 (morning).

(2nd and 3rd Sections meeting jointly.)

Mr. LE BESNERAIS, PRESIDENT OF THE 3rd SECTION, IN THE CHAIR.

— The Meeting opened at 9.30 a. m.

The President (in French). — Today we have to examine jointly with the members of the second Section, a question which interests the representatives of the Locomotive Running as much as those of the Operating Departments, namely the best method to use for signalling main lines over which trains run at high speed.

I will ask the Special Reporter to read

his summaries. I will then call upon the other reporters to speak if they have any additions to make."

Everybody will be able to take part in the general discussion, after which we will examine one by one, all special points and then the summaries.

Mr. Stäckel, *Special Reporter* (in German) then gave a brief review of the signalling of the main lines, of the grouping of signals, and of the choice of sites

for the signals. He explained the signalling of junctions, and the necessity for perfecting the signalling of paths to be taken at low speed, and spoke of the advantages of the disc over other forms under certain circumstances. He pointed out that question XI follows upon question IX of the London Session, and suggested that the summaries adopted in 1925 be completed.

— Mr. Stäckel then read a summary of his special report as published in the English edition of the *Bulletin* for May 1930, page 1448.

The President (in French). — I will briefly review the able summary just given by the Special Reporter.

Mr. Stäckel has told us that at the present time on lines over which trains run at high speed, the signalling is based upon two signals: a home signal, and a distant signal. He stresses the importance under different conditions, of the grouping of the main signals.

He pointed out that the home signal might have three meanings. A fourth meaning is even used in America for very heavily loaded goods trains. An important question is that of the distance between the home and the distant signal covering it. He then dealt with the question of signals covering facing points either at the entrance of stations, or at junctions; there are two principles in the meaning of signals: signals known as « geographical » which give the driver information as to the direction that he is to follow, or « speed » signals which advise the driver whether he is to reduce speed or not.

The general tendency at the present time appears to be to substitute speed signals for geographical signals.

The question of speed reduction sig-

nals is connected with the question of speed signals at junctions. As regards this, in France as in Germany, many accidents have called attention to the question of announcing the reduction of speed before reaching the point affected.

As regards principles, this question gave rise to summary No. 4 of question IX of the London Congress. Mr. Stäckel has very correctly related the matter occupying our attention today to that dealt with in London where the following text was agreed:

The Congress notes that certain administrations operate lines with heavy traffic and with mixed traffic by using only « Stop » and « Caution » signals with two positions. Others prefer three-position semaphores and yet others consider a fourth position indispensable.

In these circumstances the Congress considers that signalling systems should be further examined and experimented with in accordance with the ideas of each line, and that it would be advisable to put this question on the Agenda for the next Congress, so that each country may profit by the experience and the results which will be obtained during the coming five years.

This we are doing.

At the London Congress summary No. 4 dealt with the principle involved and summaries Nos. 2 to 6 with its realisation.

I will not again go over the realisation of the principle under its two main types: the plate (cible) and the arm. You notice I do not say « disc » because « disque » in French refers to the circular form whereas the plate may not be round. The two systems appear to have their advocates. For junctions, two systems are used: the vertical and the horizontal.

Mr. Stäckel has also spoken about light

signals. He then touched on the automatic block, mentioning that in his opinion the financial advantages of the system partly disappeared when dealing with stations close together.

I would ask the other reporters to let us have any supplementary remarks to the review of the question just given us.

Mr. Kristensen, *Reporter*. — The reason why this question was put on the agenda of the present Congress was, as the Special Reporter has told us, because no complete agreement had been obtained before the London Congress closed.

We might therefore, following the example of the different reporters who so interpreted this mission, limit ourselves to a consideration of these points.

In spite of this, however, I gave in my report a rather detailed description because the Reporter for Scandinavia in 1925 was unable to give information on the signals used in Scandinavian countries.

I also briefly sketched a description of the signals used in Germany. When I read Mr. Stäckel's excellent report, I realised I might have saved myself the trouble and I apologise for having trespassed on a colleague's territory. As a matter of fact, I was unaware that Mr. Stäckel had been asked to make a report for Germany.

At the London Congress, everything was done to find a general formula and there was much discussion on the form to be given the home signal and the distant signal. At the same Congress the summaries put forward by the Special Reporter, Mr. de Benedetti, were discussed at considerable length without full agreement.

The object of any signalling system is to give the driver the indications needed to cover his journey between stations,

and whilst passing them. In many countries, amongst others Denmark, we consider it not only useless but dangerous to give the driver more indications than those strictly necessary. Otherwise there is a danger of confusing the driver.

If this proposal be accepted as the basis of the discussions it would not be difficult to solve the different problems in connection with signals. But to arrive at this end, we should come to an agreement; in this way we shall also succeed in getting a general formula.

Let me try to illustrate my argument by means of an example. If a line is divided into not very short sections each section can be protected by a two-aspect signal and a distant signal, this latter being placed at a suitable distance according to the ground, visibility, etc. The signal indicating reduced speed is sited in such a way that the driver can see it far enough off, the distance being calculated according to the braking distance required. There is no need for more than two signals. The driver can continue to run at normal speed when the two signals give line clear.

Let us suppose that the weight of the train increases, or that the speed is raised, or that the line is divided into two shorter sections, so that the braking distance corresponds with the length of the section: the natural solution is the combination of the main signal with the warning signal.

Thus we get the three-aspect signal.

If in certain circumstances the length of the section becomes less than that of the braking distance, it may become necessary to have three-aspect signals. The better way would even be to use a four-aspect signal.

Such is my opinion. It is of very little use to discuss the question of adopting

the three, or two, or even four-aspect signals.

Each type is required to meet local conditions, varying from one line to another.

Mr. Stäckel in his report has very cleverly avoided the difficulty which we came up against in London. I think it will be possible today to come to agreement on the basis of Mr. Stäckel's summaries. I have hopes, although I feel I must add a few words of rather a pessimistic character.

Mr. Stäckel has come to certain conclusions which whilst being very much to the point are rather too briefly worded. If it is to serve as the basis of an international evolution, a summary should I think be worded very clearly, as otherwise it is impossible to get unanimous agreement. So as not to prolong this speech, I will reserve my other remarks until we come to the examination of the different summaries put forward.

The President (in French). — Has any one else any remarks to make on the general question before we proceed to deal with the individual summaries put forward by the Special Reporter ?

Mr. Tuja, Paris-Lyons-Mediterranean Railway (in French). — In order to complete the reviews of the question just given, it would, I think, be of interest to describe the schemes for the modernisation of the French signalling systems, and this, if you agree, I will do.

I would like to make two remarks before beginning the description. First of all, the alterations decided upon in France apply to an existing signalling system, and in consequence, when getting them out, it was essential to take care that too great changes were not made in the usual habits of the staff.

It should also be noted that the French proposals, although under consideration by the Higher Authorities, have not been definitely approved by the Ministry of Public Works.

The principles given below were followed by the French Railways in preparing the programme.

1. The French Railways endeavoured to give the drivers at night as clear indications as possible. For this reason they have suggested the adoption of the green line clear light instead of and in the place of the white light presently used. Caution and speed reduction will therefore be given by orange lights, the red light meaning stop.

In passing, I would point out that the white light for line clear was retained for special signals applying to service lines. These signals which use a violet light instead of a red for stop, will also be given a special aspect for line clear and stop so as to avoid in any way confusing the drivers running on the main lines.

2. In order to simplify the driver's work, an endeavour was made to reduce the number of signals to be observed.

To achieve this programme, the French Railways intend to group the signals as much as possible, and even when the signals are grouped, only to allow in a given group the most important aspects to appear. The light signal is particularly well adapted for this purpose, since it makes it possible to retain only the strictly useful aspects on the same panel: it will therefore be installed largely on heavy traffic lines. Furthermore, the ordinary mechanically operated signals will be grouped together as often as possible so as to simplify the indications given by night.

In the same way, care was taken to reduce the number of signals, starting

by suppressing the red disc, which in France indicated a stop to be made at the first points ahead or at the point protected, in all cases in which this signal was not indispensable.

As regards junctions, the French Railways have the intention of making the speed indication take precedence over the direction indication when running through facing points, the first indication being strengthened by being repeated near the points, the second being often suppressed. This programme well agrees with the ideas that have come to the fore in most countries of the world.

3. Taking into consideration the fact that the colour of the plate signals is not always very clear, especially when the light is poor, the French Railways have tried to give each signal a distinctive shape. The green disc, for example, which requires trains to slow down and is round at the present, like the red disc requiring trains to stop, will ultimately be triangular in shape.

4. The French Railways are entirely in favour of developing the automatic block on their main lines, especially the automatic block with light signals. They intend to make such installations as simple as possible as they consider that simplicity in conjunction with high quality apparatus is the best guarantee of safety as far as the automatic block is concerned.

Such are the projects of the French Railways. It is to be hoped that their realisation will soon be undertaken, and that in this event it will be possible to give additional information at the next meeting of the Congress as regards the way in which they were carried out.

The President (in French). — I would like to thank Mr. Tuja for his

interesting statement on a question to the successful conclusion of which he himself has moreover collaborated in a particularly efficacious fashion. Does any other member wish to speak?

Mr. Stäckel (in German). — I agree more or less with what Mr. Kristensen has just reported. He has said with reason that in London they tried to come to some agreement as to the number of aspects that should be adopted. As far as that part of his report is concerned in which he examines the signalling system used in Germany, we are all of us here much obliged to Mr. Kristensen for having extended his enquiries so as to include Germany, as this makes it possible to compare the German methods with those of other countries. The reading of my report alone did not suffice for this.

I also thank Mr. Tuja for the interesting information he has given us. I am glad to ascertain that reforms are contemplated, especially in France on many points identical with those I mentioned. I do not wish to examine the statement in detail but I should very much like to have some additional information. In the future, if these reforms are adopted, will the distinction between a permissive and an obligatory stop be maintained?

The President (in French). — There will be both the absolute and the permissive stop.

Mr. Stäckel (in German). — Will there no longer be any distinction made between these two signals?

Mr. Tuja (in French). — In order to answer this question I think it is necessary to enter into certain details.

At the present time the French Rail-

ways make a very clear distinction between a permissive and an absolute stop. The first is indicated by the square signal with red and white checker which shows two red lights at night; the second by the semaphore with a red and a green light.

In the new signalling system this distinction will be maintained. Moreover it seems to be practically a necessity with the automatic block in which a signal indicating a permissive stop is usually passed after the train has stopped on the sole initiative of the guard, which makes it necessary to give him a special indication when the signal is for an absolute stop and must not be passed.

In the future a permissive stop will be indicated by a single red light, a second red light being shown when the signal must not be passed.

Mr. Stäckel (in German). — I thank Mr. Tuja for the very valuable additional information he has just given us.

The President (in French). — I think there are no further observations to be made as far as the general discussion is concerned; so we can now pass on to an examination of Mr. Stäckel's summaries. To forward the discussion I will call attention to the following point :

In consequence of the supplementary examination Mr. Stäckel made of the conclusions of Messrs. Gibert and Noguès' report, we have to introduce in their first conclusion a sentence which figures in the text of the special report. This being so, if Mr. Stäckel wishes, I intend to take up the proposed text arranging the various sentences in a different order so as to put them in the best position.

If everyone agrees, I will pass on to the reading of these conclusions. I will take the French text and I ask the dele-

gates who do not speak French to follow the English and German texts so that no translation will be needed. In the cases where there are modifications to be proposed I have had English and German texts prepared.

This is what the special reporter has written :

As the basis for signalling express train routes, a *home signal* with *two* aspects and a *distant signal* also with *two* aspects are necessary.

Here I must make a remark which concerns the French text only. Instead of saying : « ... est constituée par un signal principal à deux positions... » we should say : « ... est constituée par un signal d'arrêt... »

Next we have to put point 1 of the conclusions drawn from Messrs. Gibert and Noguès' report. This will make it possible to give a closer connection to the same ideas, or to the ideas belonging to the same point. Messrs. Gibert and Noguès state :

The determination of the distance between distant and home signals should be based upon the most unfavourable conditions of braking and visibility.

However we should not, I think, simply say : « The determination of the distance between distant and home signals... » but we should add the word « minimum » and express ourselves as follows : « The determination of the minimum distance between distant and home... » In effect, the minimum distance is necessary having regard to visibility and braking conditions.

We will now pass on again to the first text of the Special Reporter, but go straight to the last paragraph which reads as follows :

« An extension of this signalling by

additional aspects or signal elements may be necessary for the following purposes :

A. — *Home signal* :

1. To permit the permissive passing of « stop » signals after a preliminary stop.

2. To permit heavy goods trains to run slowly past the « stop » signal on gradients.

3. To specify speed limits through the section, or on approaching the next home signal.

4. To specify a speed limit through points adjacent to the home signal (when branching off) or alternatively.

5. To indicate the route (at turnouts).

B. — *Distant signal*.

As a caution in respect of a signal indication according to A4 or A5 on a home signal (three-aspect distant signal). »

I do this in order to make the sequence of ideas more clear.

Then we have the last paragraph of the report worded as follows :

However much it may be desirable to restrict as much as possible the number of signal indications, little advice in this direction can be given without putting obstacles in the way of that increased simplification of working which can be attained by using a greater number of aspects.

I ask you to adopt the following word ing which corresponds to the same idea :

It is indispensable to reduce to a minimum the number of indications given by the signals, particularly in places where a number of signals are grouped and the suppression of the less imperative signals is to be recommended.

In this connection mechanical signals giving three or four positions, and luminous (daylight) signals, offer great

advantages, particularly when the distance between stop signals is small. The safe working of the service however places a limit on the elimination of signals.

If you agree we will consider each of these new paragraphs separately to see if there are any remarks on the text in question.

Mr. Lemonnier, French State Railways (in French). — The Special Reporter indicates as the necessary basis for the signalling of fast traffic lines : a home signal with two aspects and a distant signal also with two aspects.

This is indisputable for signal boxes where there are no facing points, so that all the trains run in the same direction. But in the case of boxes where there are facing points on to a line and which can only be taken at reduced speed is it not necessary to add the indication « reduced speed » to the fundamental indications which constitute the basis of the signalling ?

The President (in French). — The basis is formed by the two main signals. When speed must be reduced between blocks, especially when there are two directions, the secondary signal to which you refer is certainly indicated. But the two main signals form the general basis.

Mr. Lemonnier (in French). — Wherever there are facing points, the third indication is important.

The President (in French). — There is nothing in the text to say that this secondary indication is not of great importance. It says that in certain points the basis can be extended. Moreover the permissive working on automatic block sections is important. But it cannot be said that this is the basis of the signals.

Mr. Lemonnier (in French). — The supplementary information given to the driver is of the greatest importance. Where a line branches off it is not enough to say to the driver : « You may pass, or you may only run at reduced speed ». Experience shows that an indication as to the speed at which he may run is extremely important.

The President (in French). — Your remark will be interesting to bear in mind. Are there any other observations ?

Mr. Wais, North of Spain Railways (in French). — In my opinion a few words might be added on the subject of three-aspect signals since these are increasingly used. I think I ought to mention what has been done in Spain during the last few years. On the Spanish lines the automatic block has been installed over a distance of about 200 km. 121 (miles) consisting for the most part of three-aspect daylight signals, while the remainder are semaphores also with three aspects. On the 200 km. with the block system there are three-aspect signals which are worked automatically by track circuits. The results obtained are excellent, both from the point of view of the working of the block and the facilities given to the running by three-aspect signals, so that we are encouraged to make use as far as possible of this system on those sections of the line where the traffic is dense.

It is evident that in many cases, the two-aspect signal is a perfect solution to the signalling problem, but in view of the appreciable advantages offered by three-aspect signals and their increasingly extended use, I propose that a paragraph worded as follows be added :

« However a tendency to use three-as-

pect signals is observed, especially in the case of automatic block installations. »

The greater part of our three-aspect signals and daylight signals installations were introduced after the London Congress and their development up to this date is so great that in my opinion it is worthy of mention.

The President (in French). — It is rather a question of realisation than of principle. The sentence should be inserted further on. In the French text we say : « La base nécessaire de la signalisation des lignes à circulation rapide est constituée par un *signal d'arrêt* à deux indications et un *signal avertisseur* également à deux indications. » There are only two aspects in each case.

I propose not to make the addition asked for now, but to consider if later on. I think we are all in agreement about the first paragraph. (*Hear ! Hear !*)

I pass on to the second paragraph :

The determination of the minimum distance between distant and home signals should be based upon the most unfavourable conditions of braking and visibility.

Mr. Bals, Rumanian State Railways. — I hope I will be excused if I come back for a second to the preceding sentence. Would it not be useful to say at the end : « and a distant signal also having two aspects. »

The President. — We will speak about it by and by, but let us keep things clear.

There are no observations to be made about the proposed text of the second paragraph. I will therefore consider it as adopted.

To continue :

An extension of this signalling by additional signal aspects or signal elements

may be necessary for the following purposes.

I note the expression « may be necessary... ». It seems to me that this rightly stresses the important character attributed to such additions. I think we can adopt the text. (*Adopted.*)

To continue :

A. — *Home signal.*

1. To permit the permissive passing of « stop » signals after a preliminary stop.

Mr. Willaert, *Reporter* (in French). — I think the supplementary indication relative to junctions should come first. We should therefore begin the text by No. 4.

The President (in French). — This should be borne in mind. We will continue the reading of the text and consider afterwards if the order should be changed.

I pass on to 2.

2. To permit heavy goods trains to run slowly past the « stop » signal on gradients.

— Adopted.

3. To specify speed limits through the section, or on approaching the next home signal.

— Adopted.

4. To specify a speed limit through points adjacent to home signals (when branching off), or

5. To indicate the route (at turnouts).

Mr. Stäckel (in German). — From the point of view of Central Europe there is nothing to prevent Mr. Willaert's observation from being taken into account. The question of branch lines could therefore be put in the first place. But it

would be interesting to hear the opinion of the representatives of the French Railways.

The President (in French). — If you will allow me in spite of being president, to give you the necessary explanations, I must say that the matter is of hardly any importance to us. It is a question of giving supplementary indications where necessary. In each case we consider if it is useful to add to the signalling. We do not enjoin any conclusion on the subject. If Mr. Willaert thinks that the question of branch lines should come first, we see no difficulty. I think all the French delegates are of my opinion.

Mr. Willaert, you propose therefore to put Nos. 4 and 3 first ?

Mr. Willaert. — Yes, Mr. President.

The President (in French). — This gives great importance to the geographical signal, whereas the general tendency is to limit its scope. I am simply calling your attention to the consequences of your proposal.

Mr. Willaert (in French). — I do not insist, since from the point of view of the summary no subsequent effect is likely.

Mr. Palmieri, Italian State Railways (in French). — I second Mr. Willaert's proposal. Among the supplementary indications, that relating to the junctions is certainly the most important. In my opinion it should be placed before the signal covering the junction.

The President. — Under these conditions you are proposing to place the different points in the following order : 4 — 5 — 1 — 2 — 3.

Mr. Palmieri. — Exactly.

The President. — Are there any objections to this proposal?

As no one wishes to make any remark, I will take the proposal as adopted.

We will pass on to B.

B. — *Distant signal.*

As a caution in respect of a signal indication according to A4 or A5 on a home signal (three-aspect distant signal).

Mr. Palmieri (in French). — I do not understand why the words « three-aspect... » have been put in parenthesis. It is our custom to use a signal before the junction signal, this signal having the same form as the main junction signal: if this signal has an enlarged end it is a distant signal. Each arm repeats the indications of the main signal.

The President (in French). — The French Railways intend in certain cases to give the distant signal the same shape as the main signal. This has in fact been done already. Under these conditions it is a question of installation and not of principle.

Mr. Stäckel (in German). — From the German point of view the matter is of hardly any importance. I am prepared to agree that in the French text the meaning might not be the same. I propose that the words should be suppressed.

The President (in French). — Is there anything to be said against suppressing the words: « (three-aspect distant signal) »?

Mr. Pellarin, French Est Railway (in French). — Is it not rather a question of form? It is to be desired that the

text should be self-contained as much as possible. It runs:

B. — Distant signal. As a caution in respect of a signal indication according to A4 or A5 on a home signal.

Supposing one had not read Mr. Stäckel's report and did not know that this passage referred to the preceding paragraph, one might be puzzled about its meaning. Could it not be simplified?

The President (in French). — Would you leave the task of finding the definitive phrasing to the secretaries? I think the text might be considered as adopted, the final words however being suppressed.

Mr. Willaert (in French). — Would it not be of interest to point out in what case the three-aspect distant signal should be employed? Nor have we said what this special indication consists of.

In Belgium we have signals not with three, but with four aspects. Unfortunately they are called three-aspect...

The President (in French). — That is why I have not spoken about them.

Mr. Willaert (in French). — The essential is to have a distant signal giving speed indications. Since the load of the trains has become of greater importance and the speed increases, we find speed indications very necessary, especially in the case of junctions.

In my opinion, it is useless to discuss two, three or four-aspect signals. The essential is to lay down the law on the indication to be given to the distant signal.

I should also like it to be stated in what cases the three aspects of the distant signal are used. We do not state this here.

The President (in French). — They are used when needed. What other reason could there be than that of giving the driver the necessary orders? We cannot enumerate all the cases: curves, good or bad visibility, etc. There are principles about the direction of signals, the chief being that when the driver sees a signal he must know what it means.

For the cases of application, if you have a text to propose I will gladly submit it to the assembly. But it seems to me that it is useless to talk about cases of application.

Mr. Willaert (in French). — The text begins by a case of application:

B. — *Distant signal.*

1. To indicate a limitation of speed A1 or A5 on the home signal.

The President (in French). — Your remark is of the same order as that of Mr. Pellarin. When we have considered the whole question we will be better able to judge what we wish to do in this case.

I am now going to read the rest of the text. It is my proposal:

« It is indispensable to reduce to a minimum the number of indications given by the signals, particularly in places where a number of signals are grouped and the suppression of the less imperative indications is to be recommended. »

Is everyone agreed?

— Adopted.

« In this connection mechanical signals giving three or four positions, and luminous (daylight) signals, offer great advantages, particularly when the distance between stop signals is small. »

Here the observation about three-

aspect signals might be inserted. This text is satisfactory as it says: « Mechanical signals giving three or four positions... » Are there any remarks?

— Adopted.

Next:

« The safe working of the service however places a limit on the elimination of signals. »

— Adopted.

I will now pass on to the *second* resolution. This tends to complete that taken at the London Congress. It says:

For distant signals, which should be on a level with the engine driver's eye, a disc may be used as a cautionary « stop » signal.

Mr. Kristensen (in French). — On many railways the disc has been completely abandoned in favour of small signals with arms of a special shape. In the countries concerned, prolonged trials of this method have not revealed any drawbacks.

In the resolution proposed by the Special Reporter to complete resolution 2 of the London Congress, I propose the suppression of the words: « which should be on a level with the engine driver's eye... »

In Holland and Denmark, for example, where disc distant signals are used we make use of small disc signals on the same level as the engine driver's eye. The small problem of having signals on a level with the engine driver's eye can be solved by means of the distant signal and the disc signal.

Therefore I think that this phrase is unnecessary and I propose the following wording for this text: « For distant sig-

nals, a disc may be used as a cautionary « stop » signal. »

Mr. Noguès, *Reporter* (in French). — I unite with Mr. Kristensen in proposing the suppression of the phrase « which should be on a level with the engine driver's eye... ». Why should this recommendation be generally applied to all distant signals? The conditions of visibility in comparison with the height at which the signals are placed are not the same for the disc and the semaphore. On the other hand on express traffic lines, the visibility of the distant signal is as important as that of the main signal. If it is a question of fixing the height at which signals shall be placed why speak only about distant signals?

The President (in French). — Before putting the suppression of this phrase to the vote I wonder if it would not be possible to say: « In certain cases the use of a disc might also be considered. »

Mr. Stäckel (in German). — I unite myself to the proposal of the President, especially as we have just learnt that in France discs will continue to be used for the main signals.

Mr. Pellarin (in French). — After the word « considered » the phrase « putting it on a level with the engine driver's eye » might be added.

Mr. Ikegami, Japanese Government Railways (in French). — In cases where the track has many curves, as in Japan, it might be dangerous to put the signals on a level with the engine driver's eye as he would only see them at the last minute.

The President (in French). — In

Japan there are only semaphores and no discs, so the text would not apply to you.

Mr. Willaert (in French). — I continue to support the proposal to suppress this paragraph because I do not see any necessity to stress the form of the signal, disc or otherwise.

The President (in French). — The reason is that it was said in London: « When three-position signals are used, the movable arms should give the following indications. ». It was a question of movable arms only.

— The President then put the matter to the vote, and his text proposed in agreement with the Special Reporter was adopted under the following definitive form:

« In certain cases, the use of a disc signal, placed on a level with the eye of the driver can also be considered. »

We pass on to the third resolution by which the Special Reporter proposes to complete the 3rd summary of the London Congress:

« Any further signal aspects that are necessary can be obtained by grouping these lights in pairs or banks, which may be vertical, horizontal or diagonal, or by the addition of a marker light, or by a searchlight arrangement. Care must be taken that the extinction of one light does not result in a more favourable signal indication. »

Mr. Noguès (in French). — I think that the word « blanc » after « l'adjonction de feux de repère » should be suppressed in the French text ⁽¹⁾. These

(1) The English text remained unaltered on this point.

need not necessarily be white. They are not in America, nor in the greater part of the installations of the Spanish Railways.

The President (in French). — Therefore in your opinion it should read « par l'adjonction de feux de repère » without any mention being made of the colour.

Mr. Pellarin (in French). — I wish to introduce a modification in the form of the text. Would it not be better to say : « an indication less favourable to security. »

A Delegate (in French). — Would it not be better to say : « it does not give an indication unfavourable to safety » ?

The President (in French). — We have therefore two proposals : the first to suppress the word « blanc » after « repère » ; the other to replace the passage at the end of the text « in a more favourable indication » by « an indication less favourable to safety » or « an indication unfavourable to safety ».

Which do you prefer, Mr. Reporter ?

Mr. Stäckel (in German). — I agree with these modifications.

The President (in French). — I think we would all be in agreement if we said : « Any further signal positions that are necessary can be obtained by grouping these lights in pairs or banks, which may be vertical, horizontal or diagonal, or by the addition of a marker light, or a flashlight arrangement. Care must be taken that the extinction of one light does not result in an indication less favourable to safety. »

— Approved.

As far as the *fourth* and *fifth* resolu-

tions of the London Congress are concerned, no modifications are proposed.

On the other hand the special reporter proposes to complete the *sixth* London resolution as follows :

Daylight signals have the advantage over position signals (semaphore-disc) that their visibility is not affected by an unfavourable background, by mists or by twilight. They avoid moving parts which may be affected by frost.

Special attention must be directed to a good beam angle on curves and to good visibility for trains passing close to the signal; also to a reliable supply of electric current.

On the other hand Messrs. Gibert and Noguès' report leads to the following addition :

Daylight signals are particularly suitable for giving more than three signal indications on one signal, by the supplementary use of various groupings of pairs of coloured lights. A comprehensive signal of this kind which shows to the observer at any time only one definite signal is preferable to the combination of several two or three-aspect conformation signals.

Mr. Noguès (in French). — It seems to me that the text of the London summary is more in favour of daylight signals than that now proposed. During these last years the growing use of these signals may be ascertained. In America there are 16 000 km. (10 000 miles) of track with signals with coloured lights. In Spain, they have been used up to a certain point with favourable results. I propose the addition of a declaration of the importance of coloured lights.

The President (in French). — Do you wish it to read : « Daylight signals with coloured lights... »

Mr. Noguès (in French). — I should like the extended use of coloured lights to be mentioned.

Mr. Stäckel (in German). — It seems to me that it is premature to put « coloured lights » in the foreground as they are not used to any great extent in Europe. I have however nothing to say against them.

Mr. Palmieri (in French). — I am in favour of Mr. Noguès' proposition. The use of daylight signals is becoming more and more general, especially in America. The advantages of this system are doubtless numberless, and I think that daylight signals with coloured lights, especially in the case of lines with the automatic block and in the case of electric traction, are more advantageous than signals depending on form.

So I think we might very well mention the present situation in our summaries which, otherwise, will hardly differ from those of London, although between 1925 and 1930 there has been a great deal of progress in the question and in several countries a great many installations of daylight signals with coloured lights have been made.

The President (in French). — I propose to add : « The use of daylight signals, and particularly coloured light signals, is becoming more and more general. »

Mr. Stäckel (in German). — Agreed.

The President (in French). — We might even say : « ... and particularly of coloured light signals is becoming more and more general, even on non-electric systems. »

Mr. Renard, French Est Railway (in

French). — I propose a slight modification of the Special Reporter's additional sentence inspired by Messrs. Gibert and Noguès' report. It reads : « ... if recourse is had to different groupings of *pairs* of coloured lights. » I think the word « pairs » could very well be omitted as it would suffice to say : « if recourse is had to different groupings of coloured lights. »

Mr. Bennet Moore, Eastern Bengal, India. — I wish to know if, in the case of converging lines, the indications are given by the same signal or by separate signals.

The President (in French). — For junctions, special signals are usually employed.

Mr. Collin, Ministry of Public Works, France (in French). — I propose that the task of revising the wording should be left to the secretaries, as perhaps the text presented is not quite correct. In such matters great care must be paid to the clearness and precision of the wording.

The President (in French). — Therefore the texts read may be considered as adopted, with the reserve of certain modifications presented and admitted.

A Delegate. — Adding to your proposal a mention of non-electric lines.

The President (in French). — Agreed. We will suppress the word « pairs » and non-electric lines will be mentioned.

The secretaries will revise the text and submit the new wording to you. With this reservation the resolution is adopted.

The Special Reporter also proposes to complete as follows the *seventh* resolution of the London Congress which re-

commends the study of the use of the automatic block with daylight signals :

Automatic block working with suitable layout and methods of installation gives a better safeguard against incorrect signalling than manual block working.

Considerable economy can be obtained with the automatic block system on lines where the stations and signal boxes are far apart, but not where they are close together. Further, the automatic block system should be restricted to lines laid on wooden sleepers and, when these carry dense traffic, it should be installed only where there is no objection to the permissive passage of a train into an occupied block section.

Concerning Messrs. Gibert and Noguès' report, Mr. Stäckel concludes :

The method of working with signals normally at « clear » offers advantages over the method with signals normally at « danger » for automatic block operation, especially if daylight signals are employed.

Are there any observations ?

Mr. Noguès (in French). — In the summary it is affirmed that :

Considerable economy can be obtained with the automatic system on lines where the stations and signal boxes are far apart... »

We consider that it can also be obtained when they are close together. The automatic working of the signals in many cases makes it possible to reduce the number of men employed, and the resultant economy will be as much greater as there are more signal boxes.

The President (in French). — Signal boxes are not stations where there is always some staff. For example there are

signal boxes at junctions. Here we are speaking of signal boxes where it is always necessary to have someone, even with the automatic block system. When it is necessary to have a man in the signal box with the automatic block the advantages of the system disappear.

Mr. Noguès (in French). — We have found that there was some economy in staff on lines equipped with the automatic block, particularly in the cases of the small intermediate stations where we left the signals to work purely and simply automatically as this enabled us to suppress the staff in the signal boxes of these stations in the case of trains simply passing through.

The President (in French). — We might add after « signal boxes » the words « which it is necessary to have manned ».

Mr. Stäckel (in German). — Agreed.

Mr. Pellarin (in French). — I think that the wording is too arbitrary. In the sentence : « Le bloc automatique peut donner des résultats économiques importants sur les lignes à stations et cabines très espacées, mais non si ces points se suivent de près », « très » ⁽¹⁾ is too arbitrary.

The President (in French). — We might put « relativement espacées ».

Mr. Pellarin (in French). — That would be better. Furthermore would it not be preferable to say that the further apart the stations and signal boxes are the greater will be the results obtained, wording the passage as follows : « The

(1) Does not exist in the English translation of the special report.

automatic block system enables savings to be made which are increased commensurately as the distance is increased between signal boxes which it is necessary to have manned » ?

The President (in French). — This proposition might replace the first sentence. Are there any objections ?

Mr. Stäckel (in German). — I favour this proposal.

The President. — Are we all agreed ?

Mr. Noguès (in French). — I should like to see some allusion made here to the simplification of the programme and its carrying out which experience has shown to be desirable, contrary to the case in the first installations made in Europe, for which a great many conditions of control were prescribed. In Spain on the 107 km. (66.5 miles) of automatic block signalling of the Madrid-Saragossa-Alicante Railways, we have carried out our installations with a very noteworthy simplification of the original programme. The results obtained after 6 years are excellent; we have eliminated a great many of the causes of trouble and failures without the smallest accident. From what I have read the result has been the same on the French State Railways, and I think it would be interesting to know the opinion of its delegates.

The President (in French). — Have you any text to propose ?

Mr. Noguès (in French). — The summary of the report that I drew up in collaboration with Mr. Gibert might be used.

Mr. Direz, French State Railways (in

French). — I am in favour of the idea brought forward. We have made similar installations on the State Railways and during the six years during which they have been working we must admit that we are quite satisfied with them.

Mr. Noguès (in French). — This is the text in question : « The tendency is towards simplification in working methods which, without diminishing safety, shall reduce to a minimum the delays due to failures and irregularities. »

The President. — I put this addition to the vote.

— No one offering any objection, the resolution was adopted.

We now come to the summaries presented by the Special Reporter which are not supplementary to the resolutions of the London Congress. They are new ones :

The use of power operation has rendered possible the control of extensive station installations from a *single* control frame. Such centralisation is particularly expedient when the outlying points are not used for shunting.

The control of the whole of the safety appliances of a long stretch of line from a single dispatcher point has proved to be practicable, low-voltage batteries being installed locally for operating the points by means of slow-running motors. It is desirable to continue investigations into this subject.

Mr. Collin (in French). — I would like to return a minute to the preceding resolution. I would like the wording to be less imperative as far as the question of the automatic block system on lines with wooden sleepers is concerned. The sentence might be worded like this, for example : « It would further appear that in the present state of technical progress,

the automatic block system should be limited to lines laid on wooden sleepers.»

The President. — The question has been gone into in relation to lines laid on steel or reinforced concrete, but nothing practicable has been developed up to the present.

Mr. Stäckel (in German). — I did not wish to imply that nothing practicable could be realised. I was only considering the present situation.

The President. — Is Mr. Collin's modification approved?

— Approved.

I now return to the Special Reporter's resolution that I read a minute or two ago. Are there any observations?

— This summary is adopted.

The President (in French). — The Special Reporter also proposes another resolution, as follows :

The methods adopted for ensuring the safety of shunting movements at large stations are on some railways similar to

those used to safeguard the running of trains; on another group of railways, however, these safeguards are dispensed with and they are satisfied to protect the traffic against shunting by safety switches, train locks or mechanical blocks or deraillers.

It is desirable that further consideration should be given to this question, also to the advisability of making use of main signals for ensuring the safety of shunting traffic.

I think it is useful to keep this text. The question may be of importance.

Are there any observations?

— No observations being made the text was adopted.

The President (in French). — I think that these are all the proposals we had to examine, and I am sure I am expressing the sentiments of the Assembly in thanking the Special Reporter for his interesting report, and all the members who have taken part in the debate for giving to this discussion the great importance it deserves.

The meeting ended at one o'clock.

DISCUSSION AT THE GENERAL MEETING.

Meeting of the 10 Mai 1930 (morning).

PRESIDENT : Mr. JOSÉ GAYTAN DE AYALA.

GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.

ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF
AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary*. — We have now to examine the summaries relating to question XI.

These summaries have appeared in today's issue of the *Daily Journal of the Session*, where everyone has had the opportunity of studying them.

Has anyone any observations to offer ?

As no one wishes to say anything we may consider these summaries as adopted.

The President. — The summaries are as follows :

SUMMARIES.

I. — (Which completes resolution I of the London Session.)

« As the *basis* for signalling express train routes, a stop signal with two positions and a distant signal also with two positions are necessary.

« The determination of the minimum distance between distant and home signals should be based upon the most unfavourable conditions of braking and visibility.

« An extension of this signalling by additional signal positions may be necessary, for the following purposes :

« A. *Home signal*.

« 1. To specify a speed limit through

« points adjacent to home signals (when branching off), or

« 2. To indicate the route (at turn-outs).

« 3. To permit the permissive passing of home signals after a preliminary stop.

« 4. To permit heavy goods trains to run slowly past the stop signal on gradients.

« 5. To specify speed limits through the section or on approaching the next home signal.

« B. *Distant signal*.

« 1. To indicate a limitation of speed (A1 or A5).

« 2. To indicate the route at the junction (A2).

« It is indispensable to reduce to a minimum the number of indications given by the signals, particularly in places where a number of signals are grouped and the suppression of the less imperative indications is to be recommended.

« In this connection mechanical signals giving three or four positions, and luminous (daylight) signals, offer great advantages, particularly when the dis-

« tance between stop signals is small.
« The safe working of the service how-
« ever places a limit on the elimination
« of signals.

II. — (Completes Resolution II of the London Session.)

« In certain cases, the use of a disc sig-
« nal, placed on a level with the eye of
« the driver, can also be considered.

III. — (Completes Resolution III of the London Session.)

« Any further signal positions that are
« necessary can be obtained by grouping
« these lights in pairs or banks, which
« may be vertical, horizontal or diagonal,
« or by the addition of a marker light,
« or a flashlight arrangement. Care must
« be taken that the extinction of one
« light does not result in an indication
« less favourable to safety.

IV. — (Concerns Resolution VI of the London Session.)

« The use of daylight signals, and par-
« ticularly of coloured light signals, is
« becoming more and more general even
« on non-electric systems.

« *Daylight signals* have the advantage
« over position signals (semaphore-disc)
« that their visibility is not affected by
« an unfavourable background, by mists
« or by twilight; they avoid moving parts
« which may be affected by frost. Day-
« light (luminous) signals are particu-
« larly suitable for giving more than
« three signal indications on one signal,
« by the supplementary use of various
« groupings of coloured lights. A com-
« prehensive signal of this kind which
« shews to the observer at any time only
« one definite signal aspect is preferable
« to the combination of several two or
« three-aspect conformation signals.

« Special care must be taken to see that
« a good horizontal dispersion of the lu-
« minous rays at curves is given, to the
« good visibility of the signal to a train
« arrived at its foot, as also the guaran-
« tees of safety as regards the source of
« supply of electric current.

V. — (Completes Resolution VII of the London Session.)

« Automatic block-working with suit-
« able lay-out and methods of installation
« gives a better safeguard against incor-
« rect signalling than manual block-
« working. The automatic block system
« enables savings to be made which are
« increased commensurately as the dist-
« ance is increased between the stations
« and signal boxes which it is necessary
« to have manned. It would further ap-
« pear that in the present state of technic-
« al progress, the automatic block system
« should be limited to lines laid on
« wooden sleepers and, when these carry
« dense traffic, it should be installed
« only where there is no objection to the
« permissive passage of a train into an
« occupied block section. The tendency
« is towards simplification in working
« methods which, without diminishing
« safety, shall reduce to a minimum de-
« lays due to failures or irregularity.

« VI. — The use of power operation
« has rendered possible the control of ex-
« tensive station installations from a
« *single* control frame. Such centralisa-
« tion is particularly expedient when the
« outlying points are not used for shunt-
« ing.

« The control of the whole of the sa-
« fety appliances of a long stretch of
« line from a single dispatcher point has
« proved to be practicable, low-voltage
« batteries being installed locally for op-
« erating the points by means of slow-

« running motors. It is desirable to continue investigations into this subject.

« VII. — The methods adopted for ensuring the *safety of shunting movements at large stations* are on some railways similar to those used to safeguard the running of trains; on another group of railways, however, these safeguards are dispensed with

« and they are satisfied to protect the traffic against shunting by safety switches, train locks or mechanical blocks or derailleurs.

« It is desirable that further consideration should be given to this question, also to the advisability of making use of main signals for ensuring the safety of shunting traffic. »

QUESTION XII.

ECONOMICAL TRACTION METHODS FOR USE IN PARTICULAR CASES, AS FOR EXAMPLE :

A) *Organisation of train services on the minor lines of the large systems, carrying little traffic, and of little used trains on the more important lines of these systems.*

B) *Use of special tractors for shunting in smaller yards and for certain work in large yards.*

Preliminary documents.

1st report (the British Empire, China and Japan), by Mr. R. H. NICHOLLS. (See *Bulletin*, September 1929, p. 1869 or separate issue No. 25.)

2nd report (other countries, except those hereafter), by Mr. H. HUNZIKER. (See *Bulletin*, December 1929, p. 2859 or separate issue No. 42.)

3rd report (Belgium, France, Italy, Portugal, Spain and their Colonies), by Mr. O. A. GAEREMYNCK. (See *Bulletin*,

January 1930, p. 147 or separate issue No. 53.)

4th report (Germany), by Mr. LEIBBRAND. (See *Bulletin*, February 1930, p. 585 or separate issue No. 62.)

5th report (America), by Messrs. H. B. VOORHEES and Geo. H. EMERSON. (See *Bulletin*, March 1930, p. 771 or separate issue No. 66.)

Special Reporter : Mr. GAEREMYNCK. (See *Bulletin*, May 1930, p. 1460.)

DISCUSSION BY THE 3rd AND 5th SECTIONS MEETING JOINTLY.

DISCUSSION OF CHAPTER A.

Meeting of the 12 May 1930.

MR. JACOBS, VICE-PRESIDENT OF THE 5th SECTION, IN THE CHAIR.

— The meeting opens at 9.30 a. m.

The President (in French). — We have to discuss to-day two questions which are rather closely related : Question XX,

Rail motor vehicles, and Question XII, Section A. It has been felt that these two questions ought to be considered together.

First of all, I shall ask Mr. Beghin, *Special Reporter* on Question XX, to be good enough to give us a summary of his report.

Mr. Beghin (in French). — Gentlemen, three reports have been submitted on Question XX: the first, by Messrs. Brooks and Gage for all countries except Europe, the second, by Mr. Zavadil for Europe except France and the third by myself for France.

These three reports consider the different types of rail motor vehicles in service in each of the regions concerned, and their statements show that :

In the countries other than Europe, of the 1214 rail motor vehicles studied, there are 513 of 150 H. P. maximum, 533 of 170 to 300 H. P. and 168 above 300 H. P.

As the H. P. increases, the proportion of electric transmission vehicles increases relatively to that of vehicles equipped with mechanical transmission. Above 300 H. P., electric transmission alone is used. In the United States and Canada, the tendency is towards fast vehicles of less than 300 H. P. capable of pulling two or more trailers and forming a train of 150 to 200 tons weight.

In Europe (excepting France), two types of rail motor vehicle are in use : a light type, generally with a petrol engine, though occasionally with a Diesel engine of a maximum of 100 H. P. and with mechanical transmission, and a heavy type of 180 to 200 H. P. with Diesel engine and with electric or mechanical transmission.

In France, light rail motor vehicles are chiefly used, only rarely exceeding 100 H. P. and generally with mechanical transmission. Up to the present, little use has been made of Diesel and semi-Diesel engines.

There appears to be agreement between the three reports in stating that, above a certain power, electric transmission is to be recommended, despite its complexity and high cost. The petrol engine is generally used for low powers. Messrs. Brooks and Gage emphasise particularly the disadvantages due to the inflammability of the petrol. The Diesel engine appears to be the most suitable engine for high power rail motor vehicles.

In France, rail motor vehicles with electric accumulators give very good results in certain special cases.

After our report was drawn up, our Italian colleague, Mr. Lo Balbo, informed us that in Italy also many accumulator rail motor vehicles are used and have given very good results.

In France the question is under consideration, and we are expecting to see a type of rail motor vehicle constructed which will run on producer gas from wood charcoal.

From the point of view of the financial results, the information provided by the various railways have given somewhat divergent figures, which, however was to be expected, because the points of view taken up by the companies have not always been the same.

In the report which I have presented, I attempted to examine the question from a general point of view, as regards essentials and as applying to a narrow gauge railway, by considering the various expenses which make up the cost per kilometre-rail motor vehicle : staff expenses, cost of fuel, cost of lubrication and upkeep expenses. I have not taken into account depreciation, because in the present state of our investigations, we have not sufficient information to form an opinion as to the life of a rail motor vehicle. I took the maximum and minimum expenses which were indicated by

the railways who have been so good as to give me the information and I found that, in comparison with a light steam train — I must insist on the fact that I took a light train, because we should only compare things which are comparable — the saving varied from 20 to 53 %. Some companies gave me the costs for steam trains which were certainly the costs for complete trains. If, however, it is desired to compare a rail motor vehicle containing a very limited number of seats with a steam train, it is necessary to take as example a steam train performing practically the same service.

Messrs Brooks and Gage arrived at a saving of 40 % for the petrol engine and 50 % at least for the Diesel engine. Mr. Zavadzil states that it is difficult, with the information supplied him, to give definite figures, but he asserts that there is a saving.

As regards the method of using rail motor vehicles, it is found that this form of traction may be suitable for replacing existing trains if the number of passengers does not demand the use of vehicles of too great a capacity, because in that case, the advantage of the rail motor vehicles seems to me to disappear to a large extent. If the goods traffic requires a complete train every day, the passenger service may likewise be effected with a rail motor vehicle. If, however, the goods traffic only permits the use of a complete train every other day or once in three days, the method does not seem to be advisable, because the public would be obliged to wait too long for goods to be delivered. They might then show their dissatisfaction and the company might exceed times laid down in their conditions.

The rail motor vehicle is recommended at all events for making up economically

supplementary trains, that is to say, trains additional to those in the workings.

In these circumstances, I beg to propose the following summaries :

The three reports presented show that :

1. In France, up to the present, it has been the general practice to manufacture light rail motor vehicles fitted with petrol engines, the Diesel engine having so far been little used owing to its high weight and cost.

2. In Europe two types are in use :

A light type with a power of less than 100 H. P. usually fitted with a petrol engine and with mechanical transmission.

A heavy type of 180 to 250 H. P. with Diesel engine and with mechanical transmission.

3. In the remainder of the world, all these types are found, with a strongly marked tendency in the United States to very high power using Diesel engines and electric transmission.

The reports unanimously agree in stating that when the power exceeds 150 H. P., electric transmission is essential, and all find an appreciable saving in the use of rail motor coaches.

To these conclusions, which were given in my special report, I shall add :

« In short, we may conclude that :

« Whenever the traffic allows a rail motor vehicle to be substituted for a steam train, experience shows that the substitution affords a financial advantage which will be still greater when the tests in progress on the new fuels (heavy oil, charcoal, etc.) and even on other sources of energy such as electric accumulators have confirmed the results already obtained up to the present time. »

In consequence of a point raised by

Mr. Jourdain, Chairman of the Committee of the « Union des Voies Ferrées (Union of French Railways), France », I would add the following paragraph which seems to me to answer the wishes of the companies :

« Further, the Congress expresses the hope that manufacturers will produce standardized types, thereby reducing the first cost, which up to the present has been so high as to prevent the general adoption of those rail motor vehicles the use of which is really economical. »

I am referring by this to Diesel engines and rail motor vehicles using electric accumulators, which, at least as regards France, are too costly to be adopted generally by secondary railway companies.

The President (in French). — I shall now ask Mr. Gaeremynck to give us the statement of his special report on the portion of Question XII which interests us in common.

Mr. Gaeremynck, *Special Reporter on Question XII*, reads the portion of his report relating to Section A of Question XII (appearing on pages 1460 to 1465 of the number of the *Bulletin* for May, 1930) as well as his summaries relating to this Section, and worded as follows :

1. The motors most used in train working on those lines of the great railways with little traffic and the little frequent trains on the more important lines are steam locomotives of more or less light weight, of the ordinary types.

2. Many of the railways also use rail motor coaches with or without trailers, with a steam or internal combustion (explosion or Diesel) motor, the power usually reaching 100 to 150 H. P., or more, and in addition Diesel locomotives.

There is a marked tendency to extend the use of such vehicles. However their introduction is of too recent a date for definite conclusions to be formed concerning the economies resulting from their use.

3. It is quite usual for vehicles fitted with an internal combustion motor to be driven by a single man; steam locomotives are usually worked by two men.

4. It is not possible to form any conclusions as to which system is to be preferred since those elements for an estimation of their value, which only a long trial can supply, are wanting.

Mr. Lo Balbo, Piedmont Tramways (in French). — I should like to mention that Mr. Zavadjil, in his very valuable report, has spoken of rail motor vehicles with petrol engines and vehicles with Diesel engines. As regards accumulator motor vehicles, he states that they are no longer in use in Europe.

On the other hand, Messrs. Brooks and Gage report that, in Canada, accumulator motor vehicles have been in regular service since 1917 each working about 180 km. (112 miles) a day. They add that the working characteristics are very satisfactory and conclude by stating that these rail motor vehicles are economical in service when current can be obtained at a low price.

The third report, by Mr. Beghin, mentions accumulator motor vehicles employed in France by the Charentes Railway Company and gives details regarding these vehicles to show that this form of traction is financially profitable.

I would add that the accumulator motor vehicles in service in Europe to-day number about 250, 180 of which are in regular service in Germany on 7 500 km. (4 660 miles) of track; others are in service in Italy. The results obtained dur-

ing the past five years are very satisfactory.

In order to show the difference in the working costs for the two systems of traction (steam and accumulator motor vehicles) I shall quote the results obtained on a run of 100 km. (62 miles) with trains of equal capacity and on the same line, that is to say, for the same conditions of gradient, rails, stops and time-table :

1. Locomotive and two trailers, 80 seats, weight of train, 30 t. (29.5 Engl. tons) (including locomotive and passengers) :

	Lires.	
	Per tr.-km.	Per train-mile.
Expenditure :		
Coal	1.20	1.931
Oil	0.113	0.182
Wages of staff (driver, fireman, guard, and ticket collector). . .	0.943	1.518
Upkeep of locomotive . .	0.237	0.381
Total. . .	2.493	4.012

2. Accumulator motor vehicle (battery of 90 Tudor cells and two motors each of 20 H. P.) and one trailer; 80 seats, weight of train 22 t. (21.65 Engl. tons) including passengers.

Electric power (at the rate of 0.085 lire per kWh.)	0.121	0.193
Upkeep of battery by contract at 0.51 lire per train-kilometre .	0.51	0.821
Oil	0.055	0.089
Wages of staff (motor-man and conductor) .	0.472	0.759
Upkeep of rail motor vehicle.	0.111	0.177
Total. . .	1.269	2.041

As regards the electric energy, I would point out that the current is obtained

very cheaply : the batteries are charged during the night (from 9 p. m. to 6 a. m.) when the power stations have power available which they can not use for industrial purposes and dispose of it at very favourable rates. Also, there is a noticeable absence of peaks during the charging period, because the batteries are charged at constant power and in a uniform manner.

In regard to depreciation and interest on capital, it must be remembered that a locomotive and an accumulator motor vehicle cost about 8 000 liras per ton, but that, usually, an accumulator motor vehicle covers a longer mileage daily than a locomotive and in addition the number of days on which it is put out of service for repairs is appreciably less.

Under these conditions, I think it desirable for the railway and tramway administrations to proceed with tests so as to extend the use of these rail motor vehicles in ordinary service on certain lines and in limited cases. I say « on certain lines and in limited cases » because the use of these rail motor vehicles should be carefully studied, taking into consideration the gradients of the line, the weight of the train to be hauled and the speed required.

Mr. Reder, *Section Secretary*, read the following note : As the reports which have been presented do not mention the Spanish lines, it might be concluded that no interest is taken in Spain in this system of operation. On the other hand, the working conditions of most of the Spanish lines being very severe, the difficulties encountered on the introduction of a new machine are considerably increased.

For this reason, I think it would be of interest to give a brief summary of the work done in this connection in

Spain, by way of supplement to the reports presented.

The number of rail motor vehicles with internal combustion engines used in Spain is 22, three of which are equipped with electric transmission. These, together with two others having mechanical transmission, are equipped with Diesel engines. The others are petrol engine vehicles.

The period of trial has been too short to enable one to form a definite opinion on the first type of engine. However, the good results obtained by numerous Diesel locomotives which have been running for some years on several industrial and mining railways using engines of up to 100 H. P. may be mentioned.

In general, the results obtained with rail motor vehicles are not altogether favourable. However, it is difficult to give a definite opinion because only about 12 vehicles, including the 5 Diesels already mentioned and very recently put into service, of the 22 rail motor vehicles are in regular service.

In this connection, it is useful to recall that most of the Spanish lines very often have very steep gradients, alternating with easier sections, especially on the light railways. It is thus necessary to make very frequent use of the change speed gear during the journey, and when this is done the reduction in speed of the train is often very considerable and has to be effected both rapidly and skilfully. In this connection, therefore, reliance has to be placed on the driver, especially if the change speed gear, as in most cases, is of the type having gearwheels sliding on their shafts as in motor cars. As the wear of the teeth increases, the operation of the change speed gears becomes more difficult until finally it is impossible to avoid considerable shocks which damage both clutches

and engine. It follows that there is need to improve the system of change speed gear by adopting gearwheels which are permanently in mesh.

As we know, clutches should be capable of slipping. By examining this slipping during starting on a steep gradient it is easy to see that even with a single trailer, the maximum tractive effort is already reached owing to the high resistance of the train. If the clutch does not slip for a sufficient length of time, the engine is unable to build up its power as in steam or electric traction. On the contrary, the power of the engine must be reduced because it is necessary to slow down in order to allow the clutch to act. Consequently, the engine has not sufficient power to overcome the resistance of the train, taking into consideration the excessive acceleration which is impressed upon it in this case.

It follows from this that the engines of rail motor vehicles are often overloaded, especially on lines having steep gradients. I think that not only in Spain but also in other countries rail motor vehicles are not yet considered to be perfect, particularly for lines having steep gradients.

It has in fact been found that overloading causes rapid burning of the exhaust valves, and heating of the bearings and that the engines readily seize. Also, the Ferodo linings of the clutches wear out very rapidly.

These various observations in their turn lead to another deduction:

It is impossible to design a clutch capable of slipping for at least 15 to 20 seconds, for a power of 100 to 200 horse and a load hauled of 25 to 80 tons, unless use is made of purely metallic friction surfaces, capable of cooling rapidly.

A third observation of some impor-

tance concerns the range of speeds. In order to fix this range, it is necessary first of all, on lines having steep gradients, to ascertain the most frequently required tractive efforts; in most cases, this leads to an irregular gradation. The result is, on the one hand, an appreciable loss of fuel when the engine does not work under normal load for long distances and, on the other hand, a loss in speed. The calculations are rendered still more difficult if the motor vehicle has to make the run alone or with trailer.

That is why, for lines having steep gradients or very varied profiles, it is essential to discover a transmission system which will allow of every freedom in fixing the graduation of the speeds.

Lastly, I am inclined to think that, for traction on very irregular tracks, a more flexible engine than the normal engine is required. In this connection, I am unable to share the opinion put forward by Mr. Zavadjil when he says in his report that the Diesel engine is not as flexible as the petrol engine. On the contrary, theoretical considerations and the tests made confirm the fact that the Diesel is the better in this respect. It will be still more so when, beside the regulation of the quantity of fuel injected common to all types of engine, the question of the regulation of the moment when injection should take place has been studied. I conclude from this that the Diesel is the engine having the most flexibility and hence the most advantages.

Mr. Jacobs, then vacated the chair in favour of Mr. Crispo, *President of the 5th Section.*

MR. CRISPO PRESIDING.

The President (in French). — On behalf of our colleagues of the 5th Section I beg to thank the President of the

3rd Section for his kindness in permitting us to discuss in common the question of rail motor vehicles.

I shall ask the Special Reporter to present the observations which he has to make on the arguments that have just been developed.

Mr. Beghin (in French). — Question XX and the first part of Question XII have indeed several points in common. A moment ago I read the summaries which I propose for Question XX and my colleague, Mr. Gaeremynck, has put forward his summaries concerning Section A of Question XII. Properly speaking, there is no difference between these respective summaries on any point, except that my colleague, Mr. Gaeremynck, has taken up the point of view of the main line railways for which the question is perhaps not quite the same as for secondary lines.

On the main line railways, as was pointed out a moment ago, there is a locomotive stock which is in a constant state of evolution, and consequently, on the large railways, there are always a certain number of locomotives which are no longer suitable for service on the main lines and which, for the sake of economy, are allotted to the secondary lines.

On the secondary railways, the locomotive stock is less important. The question does not therefore present itself in the same way and this may explain why my colleague's summaries are not absolutely identical with mine. Properly speaking, however, there is no contradiction.

Under these conditions, I am going to read again the summaries I have proposed and if my colleague, Mr. Gaeremynck, has anything to add or if he prefers his summaries to remain separate,

the solution to be adopted will be decided by the President.

— Mr. Beghin then read again the summaries of his special report as previously enunciated and completed by the two new paragraphs, likewise previously mentioned.

The President (in French). — Are there any remarks on the subject of these summaries of Question XX ?

Mr. Lo Balbo (in French). — With respect to point 2, I should like to see a paragraph added stating that accumulator motor vehicles are also in use.

Mr. Beghin (in French). — I agree with you entirely. Moreover, in the course of my review, I have already alluded to the information you have given that accumulator motor vehicles are employed to advantage in Italy. Would you give us a text ?

Mr. Lo Balbo (in French). — I suggest we add to the end of paragraph 2 :

« However, in Europe use is also made of accumulator motor vehicles. »

Mr. Gaeremynck (in French). — Mention is also made of the fairly frequent use of the « Sentinel » and « Clayton » types of steam motor vehicles as regards the large railways of general interest, but this is not alluded to in Mr. Beghin's summaries.

Mr. Beghin (in French). — I have found that, particularly in the English speaking countries, considerable use is made of *Sentinel* motor vehicles and that in England there is a very large majority of steam motor vehicles.

Just in the same way that we have decided to add, on Mr. Lo Balbo's proposal,

a remark regarding the use of accumulator motor vehicles, I am quite disposed to insert a statement as to the use of steam motor vehicles.

Mr. Gaeremynck (in French). — Perhaps these two summaries could be combined.

The President (in French). — The summaries may remain separate and the use of steam motor vehicles may be mentioned. However, four types which could be mentioned are in use.

Mr. Beghin (in French). — I have only alluded to two types because there is the light type and the heavy type. In France, on the contrary, there are scarcely any but the light type.

Mr. Lamalle, Belgian National Railway Company (in French). — We could say that both accumulator motor vehicles and steam motor vehicles are used.

The President (in French). — The two conclusions will remain separate. We may add to paragraph 2 :

« In Europe use is also made of accumulator motor vehicles and steam motor vehicles.

This being so, I am of the opinion that we may consider the summaries of Question XX as approved. (*Signs of approval.*)

Mr. Lamalle (in French). — A simple question of wording, Mr. President. Paragraph 1 says : « In France » and paragraph 2 : « In Europe ». We could say : « In the other countries of Europe. » (*Approved.*)

The President (in French). — Are there any remarks concerning Mr. Gaere-

mynck's summaries of Question XII, Section A.

Mr. Lamalle (in French). — I should like to make a remark of a general order. I don't know whether we are not mistaken regarding the use of rail motor vehicles. On the lines of the large railways, rail motor vehicles may give good service, but there is sometimes too great a tendency to utilise them in the same way as steam trains by adding one or two trailers to the motor vehicles. In my opinion, if the rail motor vehicle is to be fully efficient, light and very numerous trains must be made. Efforts should be made to have only the rail motor vehicle as the train, and only to add a trailer in emergency.

Another consideration : On lines of average importance, the light trains only stop in the stations, which may be 2 or 3 miles apart. With the use of rail motor vehicles, it is possible to establish supplementary stops. In Belgium, where the train stops were 4 to 5 km. (2 1/2 to 3 miles) apart, we have decided to provide stops at the level crossings which occur at least every kilometre (0.62 mile). As these rail motor vehicles are very short trains, it is sufficient to build at these stops a rough platform of cinders about 30 m. (100 feet) long. The passenger takes his seat without a ticket which is issued on the vehicle. This procedure enables us to compete with the motor buses.

I thought it would be of interest to mention this matter.

Mr. Gaeremynck (in French). — This remark is to be found in my report but not in the summary.

Mr. Le Besnerais, *President of the 3rd Section*. — You could propose completing your summaries to that effect.

Mr. Czapski, Ministry of Railways, Poland (in French). — I should like to support the proposal put forward by Mr. Lamalle, because in Poland the measures which he discloses are already in force, especially as regards frequent stops between stations. This question is very interesting and is in our favour in meeting the competition of automobiles.

The President (in French). — Are there any more remarks ?

— No one wished to speak.

The President (in French). — I shall then ask Mr. Gaeremynck if he has anything further to add.

Mr. Gaeremynck (in French). — In the 2nd summary reproduced at the end of my report on Section A of Question XII, I propose to add before the last sentence beginning with « However », after the word « vehicles », the passage : « Their substitution for heavy trains allows of higher speed and supplementary stops between stations without prolonging the normal duration of journeys. » To be efficient, this method must indeed increase the number of stops without lengthening the time taken by the journey.

Mr. Beghin (in French). — The increase in speed compensates for the time lost at the supplementary stops.

Mr. Gaeremynck (in French). — We could say : « Their substitution for heavy trains allows of higher speed and supplementary stops between stations without prolonging the total duration of the journey. »

Mr. Miclesco, Rumanian State Railways (in French). — I should like to

go back to summary 2 of Mr. Beghin's report. It is said: « In Europe, two types are in use. » Would it not be preferable to say that two types of internal combustion motor vehicle are in use.

Mr. Beghin (in French). — You are perfectly right. It should be stated precisely that they are internal combustion motor vehicles.

The President (in French). — That will then be done.

Does anyone wish to speak on the subject of the proposal put forward by Mr. Lamalle.

Mr. Leibbrand, Reporter (in German). — In my opinion it is not correct to say that internal combustion motor vehicles, and rail motor vehicles, in general, allow of more frequent stops than steam locomotives. A steam locomotive with 2 or 3 coaches can stop as easily as any other train. What is done with rail motor vehicles could be done with light steam trains.

Mr. Lamalle (in French). — My remark does not apply to steam trains. With the steam locomotive, there is a tendency to increase readily the number of coaches because the necessary power is available. With the steam locomotive, there are at least three vehicles, the locomotive, the luggage van and a coach. The cost of constructing the platforms is greater because they have to be longer.

Mr. Le Besnerais (in French). — The platforms may be limited to the length of the passenger coach. There is no need to have a platform either for the locomotive or the luggage van.

Mr. Lamalle (in French). — There is another consideration. The rail motor vehicles start more easily and get away

more rapidly. Besides, if I may add a few words, in the rail motor vehicle the public is generally satisfied with two classes; in the steam train there have to be always three classes. There is also a question of a psychological character: trains with rail motor vehicles are more flexible than steam trains, and moreover they are of a new type. The public in a rail motor vehicle will be easily satisfied, if I may say so, whereas in the steam train they are more exacting.

Mr. Jacobs (in French). — Is it necessary to introduce Mr. Lamalle's remark into the conclusions as it is a matter of observation?

Mr. Moutier, French Nord Railway (in French). — What Mr. Lamalle says is a working formula which is rather difficult to codify for a matter which takes our memories back 43 years. In effect, in 1887, on the French Nord Railway, we devised train-trams comprising a single coach, with certain modifications of the technical obligations imposed on passenger trains, with a view to obtaining greater simplicity. The train-tram stopped at various points called P. A. (points d'arrêt = stops) in front of a simple platform generally paid for by the local authority, and its stop was only for a few seconds. According to the established expression employed by Mr. Lamalle, the question of fares was dealt with on the train. The stopping time, being extremely short, could not therefore be considered technically as a stop, but was rather of the nature of a simple reduction in speed such that it was possible to dispense with signals. If this system is applied to present day motor vehicles with internal combustion engines or otherwise, it is merely a technical improvement on the earlier train-

tram, a system which has already existed, which is already very old and which it seems rather late to codify, especially when the method of employing these train-trams depends upon the circumstances and the traffic. Moreover, the Nord has not confined itself in its system solely to trams, because it has even extended it to light trains of a few vehicles (8 coaches) equipped with continuous brake.

We do not know what the future has in store for us, seeing that we are now rather going back to the supplementary stops and the local trains serving them, which no longer offer the same interest in view of the possibilities of the road motor vehicle. Moreover, I consider that, in general, to attempt to write down in a Congress the conditions of use of one system or another is going a little too far. We may grant that the features of the system may be defined but to state in what way it must be used is to encroach upon the privileges of the administrations. The task of examining the cases of application according to climate, customs and circumstances must be left to the railways. To conclude, I insist that it is inopportune to attempt to codify, or even as much as to indicate to all the member Administrations, the conditions under which rail motor vehicles ought to be used.

The President (in French). — The question raised by Mr. Lamalle is interesting, as also is Mr. Moutier's remark. We must, however, come to an agreement. Instead of putting as a « summary » Mr. Lamalle's statements, I think it would be preferable to set it down as an « observation ».

Mr. Lamalle (in French). — I should be glad if the Special Reporter would

read the proposed summaries again. I think there are some which are not well worded, and I think that on re-reading them those that are out of place may be dropped.

The President (in French). — That will be done, but I think we might put « observations » instead of « summaries ». Will Mr. Gaeremynck please read them ?

Mr. Gaeremynck (in French). — « Many of the railways also use rail motor coaches with or without trailers, with a steam or internal combustion (explosion or Diesel) motor, the power usually reaching 100 to 150 H. P., or more, and in addition Diesel locomotives. There is a marked tendency to extend the use of such vehicles. Their substitution for steam trains allows of higher speed and supplementary stops between stations without prolonging the total duration of the journey. »

The President (in French). — This last sentence has been added. According to what Mr. Moutier has said, there is a tendency to put « observation » instead of « summary ». If Mr. Lamalle has no objection, we shall take his remark as being a « statement ».

Mr. Lamalle (in French). — If the Meeting is not of my opinion, let us delete the passage : « Their substitution for steam trains allows of higher speed and supplementary stops between stations without prolonging the total duration of the journey. »

The President (in French). — We shall put to the vote Mr. Lamalle's proposal to add the text which has just been read.

Will those in favour please show their hands. There are 14 in favour.

Those not in favour — 17.

Mr. Le Besnerais (in French). — I voted against it, because of the passage : « Their substitution for steam trains » which appears to me to be too restrictive.

Mr. Lamalle (in French). — Supposing we put « Their substitution for heavy trains »...

Mr. Le Besnerais (in French). — Then I should agree.

The President. — We should say then : « Their substitution for heavy trains

allows of higher speed and supplementary stops between stations without prolonging the total duration of the journey. »

— The new text was unanimously approved.

— Articles 3 and 4 of the summary did not give rise to any objection.

The President (in French). — We have thus completed the discussion of the first part of Question XII and I have to thank the Reporters for the valuable reports they presented. (*Applause.*)

— The members of the 5th Section then withdrew and Mr. Le Besnerais took the chair in place of Mr. Crispo.

DISCUSSION ON CHAPTER B OF QUESTION XII.

The use of special tractors for shunting in smaller yards and for certain work in large yards.

MR. LE BESNERAIS IN THE CHAIR.

The President (in French). — There are still two points for us to examine : first, the second part of Question XII and then the questions to be put on the agenda of the next Congress.

Will Mr. Gaeremynck, *Special Reporter*, read us his report and give his summaries.

Mr. Gaeremynck read the part of his special report relating to Chapter B, appearing on pages 1463 to 1465 of the May 1930 number of the *Bulletin* and the summaries arising from the different reports presented and which are as follows :

I. — The engines with which shunting in small stations and certain operations

in important stations can be cheaply performed, are :

1. Electric capstans, alone or in conjunction with turntables; electric transporters and transporters hauled by a tractor capstan or locotractor. The tractors are especially valuable for shunting on lines to which access through the points is not possible.

2. Locotracors with or without a capstan and worked by a single man. These locotracors are usually fitted with an explosion motor, sometimes with a Diesel or steam motor or with electric motors with accumulators.

They can be run on any track accessible to wagons.

Petrol, Diesel and accumulator tractors have the advantage over steam loco-

tractors of being always ready for work, and can be driven by the ordinary station staff.

3. Road tractors with rubber tyres independent of the track and therefore very flexible in use. They are particularly suitable for operations otherwise carried out with the help of horses.

II. — Horses have practically ceased to be used for traction purposes.

The President (in French). — I thank the Special Reporter for his interesting report.

Are there any remarks of a general bearing on the subject under consideration ?

— No one asked to speak.

The President (in French). — Then we shall proceed to the examination of summary No. 1, with a view either to adopt it as it is or to introduce amendments in it.

I think it of interest to point out that all the Reporters, excepting the German Reporter, have dealt in a limitative manner with the question set.

The German Reporter has chosen to complete his study by considerations of a general character on the whole of the steps to be taken, not perhaps to obtain more economical methods, but to render the economical working of lines of relatively little importance at least possible. This question is very interesting, and despite the fact that it does not appear directly on our agenda, I am grateful to Mr. Leibbrand for having given us information which, for myself, I only knew incompletely.

Are there any remarks concerning the 1st paragraph of point 1 ?

— The 1st paragraph was adopted.

The President (in French). — Does anyone desire to speak on the subject of the second paragraph ?

Mr. Tuja, Paris-Lyons-Mediterranean Ry. (in French). — According to the statements of the Special Reporter, it seems that locotracors for station shunting may be used under two conditions : shunting in a particular station or travelling from one station to another on the main line. I would ask if it is not of interest to mention these two possible methods of use.

Mr. Gaeremynek (in French). — Travelling between two stations is certainly part of the station shunting.

The President (in French). — Travelling in itself does not form part of the shunting, and that is precisely the value of certain locotracors which after having done their work in one station may proceed to another, where they again do the same duties, thus serving three or four stations without losing time on the way. This is one of the economical methods of traction in stations.

Mr. Tuja (in French). — Would it not be possible to insert in the 2nd paragraph of summary I : « They can be set aside for shunting at a particular station or for working several stations by travelling from one station to another on the main lines ? »

The President (in French). — I do not think this would be a reason for suppressing the paragraph of the report. It is an addition, not a substitution. We could say : « They can moreover be adapted for shunting at a particular station, or adapted for working several sta-

tions by travelling from one station to another on the main line. »

— Adopted.

As regards the 3rd paragraph, the end could be amended by saying : « ... pour les manœuvres exécutables autrefois à l'aide de chevaux » (« for shunting which formerly could be done with horses »).

Mr. Gaeremynck (in French). — Shunting which *could be done* with horses *is always possible* with horses.

The President (in French). — We could say : « pour les manœuvres qu'on pourrait exécuter à l'aide de chevaux » ⁽¹⁾.

Mr. Lamalle (in French). — Point II states that horses have practically ceased to be used for traction purposes.

The President (in French). — I think that this is the last time that the use of horses for shunting purposes will be mentioned. Future Congresses will not, I think, have to examine this question.

Mr. Le Poittevin, French Nord Ry. (in French). — Do you not think that some reservations should be made regarding the economies to be expected from the various systems of tractors ? We say in our summary that shunting can be performed cheaply by them. Are we quite certain of this ?

The cost of upkeep and depreciation appear to be much greater for a petrol engine than for a steam engine. The mileage costs remain within fairly moderate limits for a road motor vehicle or rail motor vehicle run on petrol, travelling at an average speed of 30 km. (18.6 miles) per hour, but on a tractor,

having an average speed of 3 km. (1.86 miles) per hour, the engine makes 10 times as many revolutions for the same journey, and will probably be useless after but a short service. Would it not be advisable to reserve this conclusion until a longer experience of the use of these engines has been gained ?

The President (in French). — Mr. Le Poittevin has just said that by enumerating in a uniform manner the economical engines employed : explosion engines, Diesel engines, electric motors, accumulator motors, we appear to say that they are all economical. He considers that the explosion engine causes heavy upkeep costs when it is a matter of travelling at a low speed and he proposes to take this observation, which may be correct, into consideration. Extended experience of the use of these different methods alone will show which of them are actually economical in use.

Mr. Gaeremynck (in French). — Agreed, but I am convinced that they are more economical because it is a question of intermittent shunting. In this case, the locomotive would be more expensive.

The President (in French). — The proposal put forward by Mr. Le Poittevin does not refer to the use of these engines but to the tendency to say that some of these engines are or are not more expensive than the others.

Mr. Leibbrand (in German). — One cannot form any judgment as to the economical value of tractors by taking the costs of their fuel and maintenance as sole criterion; they become economical because economies can also be secured with them owing to the fact that they increase in a remarkable way the commercial speed of the trains which results

(1) The English text remained unaltered.

in economies in the staff of the trains and in rolling stock. Sometimes, these tractors are more expensive as regards fuel and maintenance than the heavy locomotives but, at the same time, more economical as regards administration and operation.

The President (in French). — Mr. Leibbrand considers it regrettable that all the systems have been put on the same level. He maintains that there is insufficient experience yet to enable us to dispense with reservations. It remains for trials, he says, to show which system is the most advantageous.

Mr. Tuja (in French). — The remark is correct. However, on our lines we have made trials with 80 appliances and we have decided in favour of the new system because their use has enabled us to realise a profit varying from 500 000 to 1 million francs.

Mr. Le Poittevin (in French). — I must admit that we have not made such extensive trials.

The President (in French). — Mr. Le Poittevin does not say that the earlier appliances are more profitable. I would ask Mr. Tuja if comparisons have been made with other engines than the Diesel?

Mr. Tuja (in French). — Theoretically, everything is in favour of the Diesel.

The President (in French). — I think that the conclusion may be kept in its original wording with the addition of the following passage : « Certain of these systems have not yet been used sufficiently, in practice, to allow of a choice being made between them. »

Approved.

Mr. Frank (Polish State Rys. (in French). — With respect to the 3rd paragraph, it would, I think, be expedient to delete the words « with rubber tyres ». Tractors not fitted with rubber tyres cross the tracks very satisfactorily.

Mr. Gaeremynck (in French). — The information I have received is such that it seems unnecessary to me to add or delete anything. Where tests have been made with « caterpillars » the system has had to be abandoned because it did not give good results. On the other hand, rubber tyres have been retained. Road tractors without rubber tyres are never heard of.

The President (in French). — According to the information received by the Special Reporter, the words « rubber tyres » ought to be retained. It seems to follow from the discussion that these words ought to be deleted.

I shall therefore put the matter to the vote.

— The majority was in favour of the deletion of these words.

The President (in French). — In regard to point II, it is necessary to state that horses have practically ceased to be used for traction purposes. We have to note that this is the end of a period. Are there any remarks ?

— No objection was raised regarding this point.

Mr. Leibbrand (in German). — Tractors which travel on the main lines and road tractors have been mentioned. At Magdeburg-Rothensee we have a tractor which runs on a narrow gauge track. The words « tractors for special tracks » ought to be added. These tractors effect

the same service as the tractors of the French Est. It seems to me expedient to mention them.

The President (in French). — Mr. Leibbrand proposes to add a remark mentioning the use of tractors of a gauge narrower than the standard. He submits the following text :

« 4. Road tractors or tractors for narrow gauge lines specially laid down in shunting yards for assembling marshalled wagons, without stopping marshalling operations. These considerably increase the capacity of marshalling yards, and provide means of reducing damage to trucks and of reducing working costs. »

Are there any objections ?

Mr. Janet, Ministry of Public Works, France (in French). — I am afraid that the tractors with rubber tyres which are used for the same purposes in marshalling yards will be relegated to a secondary place.

The President (in French). — The two types are mentioned : road tractors and tractors for narrow gauge lines.

Mr. Gaeremynck (in French). — That corresponds to what is contained in Mr. Leibbrand's report.

The President (in French). — There being no other remarks, the text submitted by Mr. Leibbrand will be inserted in the summary, and will appear as the 4th summary.

Therefore, the whole of the summaries of Question XII have now been agreed.

With your permission, I shall now look ahead and submit for your consideration the questions to be put for the next Congress. The General Secretary has sent me the text of the following four ques-

tions which have been proposed by various Administrations and from which we have to select three :

1. — Scientific methods and the preparation of time tables.

2. — Allocation of freight rolling stock. Investigations into the turn-round of goods vehicles. Separation of the elements included in it. Methods of reducing the period of turn-round.

3. — Organisation for carrying small consignments of goods and the most suitable methods for their delivery with the least delay. Use and selection of fixed and mechanical transshipping plants.

4. — Automatic train control and train stop. Track equipment. Locomotive fittings. Methods used for repeating signals on the locomotives. Devices intended to ensure the attention of the drivers.

In connection with the first question, Mr. Leibbrand has pointed out to me that the German text has not the same meaning as the French text. Usually with us, « Horaire » is « Fahrplan », but « Fahrzeit », the duration of the journey has been put down. Is duration of journey meant? The text is doubtful : the « horaire » of a train is the time of its departure and the time it takes to travel a certain distance.

Mr. Janet (in French). — Does not « Fahrplan » necessitate the consideration of the « Fahrzeit » ?

The President (in French). — « Fahrplan » may be independent of « Fahrzeit ». The method of drawing up the two timetables may differ.

Mr. Lamalle (in French). — Pardon me for asking a question of a general nature : Do you not think that it would be preferable first of all to select three questions. If the first suggested is left

out, it will be unnecessary to enter into a discussion as to its interpretation.

The President (in French). — Still, it would however be necessary to know exactly its meaning.

Mr. Leibbrand (in German). — I propose that the word « Scientific » be deleted from the question.

The President (in French). — I think that would be better.

Mr. de Vasconcelos Correia, Vice-President of the Administrative Council of the Portuguese Rys. (in French). — Would it not be preferable to say « Train working diagram ».

The President (in French). — The English do not use a diagram and it is just the comparison between the English method and the others which is of interest.

Mr. de Vasconcellos Correia (in French). — « Diagram » removes the doubt.

The President (in French). — The English-speaking countries do not use it.

Mr. Leibbrand (in German). — I think that it would be better to select first of all the three questions. The remark made by Mr. Lamalle is to the point. When we have decided upon our choice we can state them precisely.

The President (in French). — Question 2 is precise.

There is an amendment to make in question 3. It should read « transports des marchandises *de détail* » instead of « *en détail* ».

In question 4 it is stated « Track equipment. Locomotive fittings ». Track equipment comprises points and junctions. This questions also will have to be stated precisely.

I will state the questions briefly :

1. Preparation of timetables.*
2. Turn-round of rolling stock.
3. Transport of small consignments.
4. Automatic train control and methods of repeating signals on the locomotives.

Mr. Lamalle. — I should much like to see the second question put first. The allocation of freight rolling stock is very important from an economical standpoint. If I could give an order of priority I should place question 2 first.

The President. — The questions are already arranged in order of priority. We shall now proceed to vote.

— The majority voted for the deletion of question 1 and in favour of questions 2, 3 and 4 being retained on the agenda.

The President (in French). — Questions 2, 3 and 4 will therefore be put on the agenda.

We have thus completed our work. Allow me, Gentlemen, to thank you for the diligence with which you have assisted us. I also wish to thank the members of the secretariat whose duties have been very heavy.

I think that we can be satisfied with this Congress which has given us the opportunity of exchanging many interesting points of view, while enabling us to come together so as to ensure by a communion of ideas the constant progress of the very important concerns under our charge. (*Applause.*)

Mr. Lamalle (in French). — We cannot part company without offering our sincere thanks to our President. (*Applause.*) He has conducted our debates with singular impartiality and competence. I do not wish my words to be regarded as an empty compliment. Mr. Le Besnerais has shown himself to be an admirable Section President. He has conducted our debates, while adhering to our programme, with dispatch,

only interrupted by pauses to allow everybody to explain his opinion. He has been able to formulate summaries corresponding to the whole of the opinions of the members of the Section.

I beg to repeat my sincere congratulations. (*Applause.*)

The President thanked the Meeting.

The Meeting rose at noon.

DISCUSSION AT THE GENERAL MEETING.

Meeting held on the 14 May 1930 (afternoon).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.

GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.

ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF
AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary* (in French). — The summaries of Question XII are divided into two parts which have appeared in the *Daily Journal of the Session*.

Are there any remarks concerning these summaries ?

Mr. Leibbrand, *Deutsche Reichsbahn Gesellschaft* (in German). — In Part A of Question XII, it is stated in paragraph 2 : « Many of the railways also use rail motor coaches... with a steam or internal combustion engine. » The words « or with accumulators » have been omitted here. Do you agree to their being added ?

Apparently it concerns an identical text for Questions XII and XX, which have been discussed in common by the 3rd and 5th Sections. As regards one of these questions, the Section itself decided to add « with accumulators ». It has not been the same for Question XII, but as accumulators are also used on the large railways, no one will see any inconvenience in the addition concerning the accumulators being made here.

Mr. Ghilain (in French). — Is every-

one agreed as regards this addition to the text which has appeared ?

Mr. Gaeremynck, *Belgian National Railway Company*. — The addition proposed by Mr. Leibbrand is in agreement with the decisions made during the discussion of Question XII in keeping with the summaries of Question XX : *Rail motor vehicles*.

Mr. Ghilain (in French). — The text of the 2nd paragraph of part A of the summary then becomes :

« Many of the railways also use rail motor coaches with or without trailers, with a steam or internal combustion engine (explosion or Diesel) or with accumulators, the power usually reaching... »

— No objection was raised and the text was adopted.

The President (in French). — Here then, are the

SUMMARIES.

Part A :

« 1. The prime movers mainly used in
« train working on those lines of the

« great railways with little traffic and
« lightly loaded trains on the more im-
« portant lines are steam locomotives of
« varying weight, of the ordinary types.

« 2. Many of the railways also use rail
« motor coaches with or without trailers,
« with a steam or internal combustion
« engine (explosion or Diesel) or with
« accumulators, the power usually reach-
« ing 100 to 150 H. P. or more, and in
« addition Diesel locomotives. There is
« a marked tendency to extend the use of
« such vehicles. Their substitution for
« heavy trains allows of higher speed and
« supplementary stops between stations
« without prolonging the total duration
« of the journey. Their introduction,
« however, is of too recent date for defi-
« nite conclusions to be formed concern-
« ing the economies resulting from their
« use.

« 3. It is quite usual for vehicles fitted
« with an internal combustion motor to
« be driven by a single man; steam loco-
« motives are usually worked by two
« men.

« 4. It is not possible to form any con-
« clusions as to which system is to be
« preferred, since only long experience
« can furnish the data necessary for ar-
« riving at a definite conclusion. »

Part B :

« I. — The engines with which shunt-
« ing in small stations and certain oper-
« ations in important stations can be
« cheaply performed, are :

« 1. Electric capstans, alone or in con-
« junction with turntables; electric tra-
« versers and traversers hauled by a cap-
« stan or a « locotractor ». The traversers

« are especially valuable for shunting on
« lines to which access through points is
« not possible.

« 2. « Locotracors » with or without a
« capstan and worked by a single man.

« These « locotracors » are usually
« fitted with a petrol engine, sometimes
« with a Diesel or steam motor or with
« electric motors with accumulators.

« Certain of these systems have not yet
« been used sufficiently, in practice, to
« allow of a choice being made between
« them.

« They can be run on any track acces-
« sible to wagons.

« They can moreover be adapted for
« shunting at a particular station, or
« adapted for working several stations by
« travelling from one station to another
« on the main line.

« Petrol, Diesel and accumulator trac-
« tors have the advantage over steam
« locomotives of being always ready for
« work, and can be driven by the ordin-
« ary station staff.

« 3. Road tractors, independent of the
« track and therefore very flexible in
« use. These are particularly suitable for
« operations otherwise carried out with
« the help of horses.

« 4. Road tractors or tractors for nar-
« row gauge lines specially laid down in
« shunting yards for assembling marsh-
« alled wagons, without stopping marsh-
« alling operations. These considerably
« all increase the capacity of marshalling
« yards, and provide means of reducing
« damage to trucks and of reducing
« working costs.

« II. — Horses have practically ceased
« to be used for traction purposes. »

The calculation of continuous girders carried on columns rigidly held at their bases.

PRACTICAL METHOD OF CALCULATION,

by R. VALLETTE,

Civil Engineer, Assistant Engineer on the French State Railways.

Figs. 1 to 6, pp. 313 to 375.

Mr. Légens wrote in the *Bulletin of the Railway Congress Association* for January 1930, an article on the calculation of a girder of this type in which he came to the conclusion that the calculation of a bridge of 11 spans ultimately involved the solution of a system of 15 equations with 15 unknowns, 5 of which equations had 7 unknowns, and ten, 5 unknowns.

As the solution of this problem is also of value in the more usual cases, we think it of use to give a method of calculation which does not involve any system of equations.

This method, which is the practical method of solving the problem, uses Bresse's formulæ and in the course of working out the solution only uses formulæ capable of resolution: it is applicable to the most general case, whether the elements are of constant or variable sections, and is moreover only the application to a particular case of the general method of calculation of continuous systems we gave in the *Annales des Ponts et Chaussées*, No. VI of 1923.

In passing we note that the general equation of Müller-Breslau

$$X_a \delta a + X_b \delta ab + X_c \delta ac = \delta o a$$

belongs *a priori* to the « Bresse me-

thod » because it can be read as expressing equal movements of a point due on the one hand to exterior causes and on the other to interior reactions, but the Bresse formulæ including the expression in a general form of these displacements as functions of the forces, allow the problem to be at once written as an equation in terms of all the factors involved.

The Bresse equations which express the equality of the displacements of a point under the two sorts of stresses (both interior and exterior) have moreover to be reduced in each particular case by selecting the axes, their general form supplying like the other methods, some unknowns, relatively very small, in the form of a difference of very large terms, which involves considerable difficulties in the calculations, insurmountable in the general case. In each particular case, the axes have therefore to be found, and in addition the partial systems to be altered.

Method.

In the case considered here it will be noticed that a girder of a given span can be calculated for its actual loads if the constants of the compression of its supports are known, that is to say the

ratio of the deformation to the stress producing it. This leads to these constants being looked for and, in order to avoid all equating, they are determined at close intervals starting from one end. This determination moreover gives the elements by which the action of a span on its neighbours may be calculated.

The general resolution given below makes these investigations more precise.

Solution.

The constants of deformation of a support can be considered as the characteristics of an equivalent post as regards

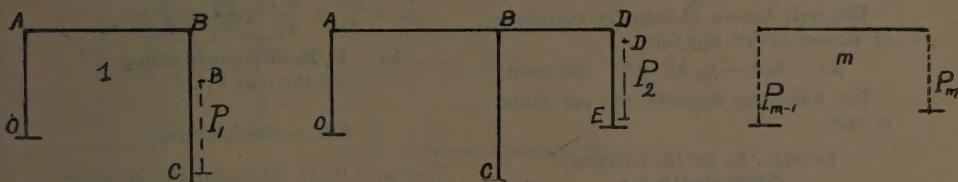


Fig. 1. — Post equivalent to a given system and equivalent span.

the deformation of this support to the whole system ending at this same support. This is to say (fig. 1) that each

system such as 1, or 1 and 2, etc., can be replaced by a simple post P_1 , or P_2 , etc., and that a given span m can be

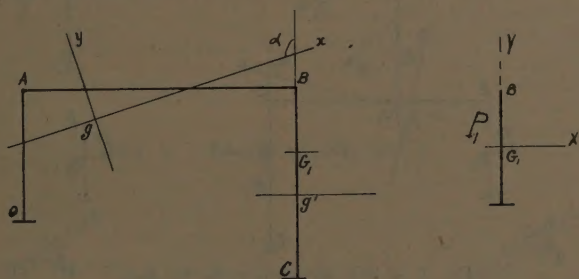


Fig. 2. — Post equivalent to the 1st span.

isolated by supporting it on the adjacent posts P_m , P_{m-1} .

The determination of each post is the automatic repetition of the following working as made for the first post.

1. Post P_1 (fig. 2).

The bracket OAB is related to its axes of inertia gxy and the column CB to its centre of gravity g' (the middle if I' is constant) and we make;

$$(1) \quad k_1 = \int_0^B \frac{ds}{I} \quad k_2 = \int_0^B \frac{y^2 ds}{I} \quad k_3 = \int_0^B \frac{x^2 ds}{I} \quad \text{for the bracket,}$$

$$k_1' = \int_c^B \frac{dy'}{I'} \quad k_2' = \int_c^B \frac{y'^2 dy'}{I'} \quad \text{for the column.}$$

These constants are readily worked out and even straight away if I and I' are constant.

To obtain the characteristics of P_{13} , all that is needed is to write that the forces developed in each part (bracket, column, post) by a common deformation balance one another.

The well known elementary equations of Bresse under the form

$$\Delta x = k_2 h - y_\beta \Delta \theta \quad \text{etc.} \quad \text{are used.}$$

The following formulæ (2) are found at once :

Constant K_1 for the horizontal displacements Δx_a .

$$\frac{1}{K_1} = \frac{\sin^2 \alpha}{k_2} + \frac{\cos^2 \alpha}{k_3} + \frac{1}{k'_2}$$

$$(\Delta x_a = K_1 H,$$

H, horizontal action placed at G.

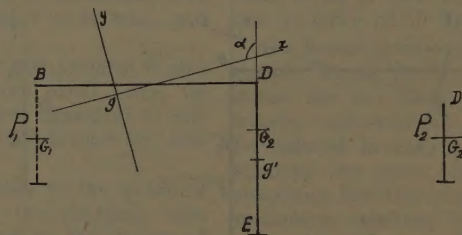


Fig. 3. — Post equivalent to the 2nd span.

3. The definite calculation of a span for its loads.

A given span m (fig. 4) can be considered as an ordinary gantry formed by two posts P_m, P_{m-1} and the girder NO : it is calculated for its own loads by the known formulæ for the simple gantry.

4. Action on the neighbouring parts.

The action R of the loaded arc on the adjacent part can be divided into a component R_1 (fig. 5) on the column MN

Centre G of the rotations $\Delta \theta$ (centre of gravity of the post)

$$Y_g = \frac{y'_g}{k'_2} K_1$$

Constant K_1' of the rotations $\Delta \theta$

$$\frac{1}{K_1'} = \frac{y_g^2}{k_2} + \frac{x_g^2}{k_3} + \frac{y'_g}{k'_2} + \frac{1}{k_1} + \frac{1}{k_2}$$

($\Delta \theta = K_1' M$. M moment acting on the post P_1).

2. The posts following.

The post P_2 is calculated by the same formulæ exactly, the bracket consisting of the post P_1 (known by its characteristics) and of BD (fig. 3), and the column being ED.

And so on for the other posts.

and a component R_2 on the rest of the system to the left. The components R_2 and R_1 are easily found by means of the fixed reactions of the moments and of the horizontal forces. All the moments M applied to the adjacent part produce in fact two reactions of fixed positions, one acting on the support and the other on the remainder of the system : the same thing occurs for the horizontal forces H passing through one selected point.

It will be seen that if these fixed reac-

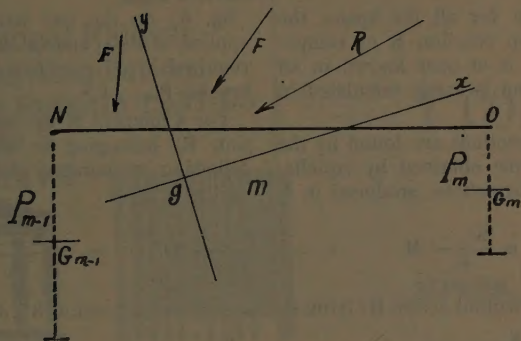


Fig. 4. — Isolated equivalent span.

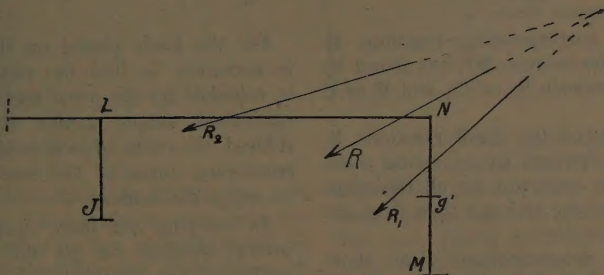


Fig. 5. — Effect of an acting force R.

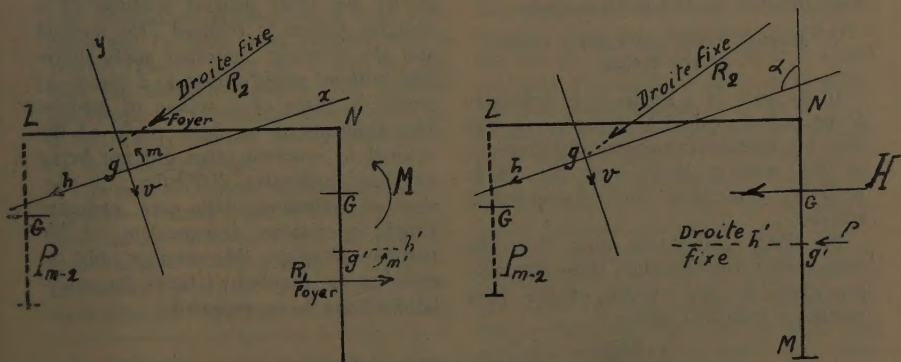


Fig. 6. — Effect of the forces M and H.

Explanation of French terms:
Droite fixe = Fixed line of action.

tions are known for all the spans, the effect of a given reaction R of components M and H is at once known in an adjacent span and is easily calculated in a distant span.

These fixed reactions are found by the following formulæ obtained by equalising the two deformations produced in N

(fig. 6) on the one hand by M or H applied at P_{m-1} and on the other by the required fixed reactions applied to the bracket P_{m-2} LN.

For a moment M we have for the reaction R_2 belonging to this bracket the following components placed on the axes of the bracket :

$$(3) \quad h_x = y_a \frac{K'_{m-1}}{k_2} M \quad v_y = x_a \frac{K'_{m-1}}{k_3} M \quad m_g = \frac{K'_{m-1}}{k_1} M$$

And for a horizontal action H , lying in G_{m-1} , we get a reaction R'_2 defined by :

$$(4) \quad h_x = \frac{K_{m-1}}{k_2} H \cos \alpha \quad v_y = \frac{K_{m-1}}{k_3} H \sin \alpha \quad m_g = 0$$

The two corresponding reactions R , applied to the column MN are found by difference between R_2 or R'_2 and M or H respectively.

The whole of the fixed reactions R_2 and R_1 is obtained by repeating automatically the operation for all the spans starting from one end and then from the other.

The four determinations given above enable the whole system to be calculated for the fixed loads : we will now deal with the case of the moving loads.

5. *Moving loads enveloping curves of the forces.*

In the case of a bridge it is necessary to be able to calculate for a given section the most unfavourable distributions of the moving loads over the whole structure and then the corresponding stresses.

For loads placed on other than the span under consideration, these elements are given by the system of the fixed reactions indicated above.

For the loads placed on this span it is necessary to find the same elements to calculate by the usual methods in the equivalent simple gantry already considered, the curve of intersection and the enveloping curve of the reactions, then to apply the loads.

In carrying out these operations for several sections we get the enveloping curves of the stresses.

This shows to what remarkable simplicity the most general solution of a complex system is reduced : the method and the formulæ indicated apply more-over *without modification* to a system of arches in place of a system of girders. The applications we have made of the method to concrete cases did not bring out any particular difficulty : it consists of repeating, with care, ordinary simple operations, independent of the number of spans, this number only increasing the number of times the calculations have to be repeated.